

W^m Egerton

1745

William Egerton

THE

MARINERS

NEW KALENDAR.



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T H E
MARINERS
NEW KALENDAR.

Containing

The Principles of Arithmetick and Geometry; with the Extraction of the Square and Cube Roots. Also Rules for finding the Prime, Epact, Moon's Age, Time of High-Water, with Tables for the same.

Together with

Exact Tables of the Sun's Place, Declination, and Right-Ascension. Of the Right Ascension and Declination of the Principal Fixed Stars. Of the Latitude and Longitude of Places. A large Table of Difference of Latitude and Departure, for the exact Working a Traverse.

A L S O

The Description and Use of the Sea-Quadrant, Fore-Staff and Nocturnal. The Problems of Plain-Sailing and Astronomy, wrought by the Logarithms, and by *Gunter's Scale*. A Tide Table. The Courses and Distances on the Coast of *Great Britain, Ireland, France, &c.* And the Soundings coming into the Channel. With Directions for sailing into some Principal Harbours.

Ephemerides

B Y

NATHANIEL COLSON, *Student in the Mathematicks*

London, Printed for *William Mount and Thomas Page*, on
Tower-Hill, 1745.

Where you may have all Sorts of *Mathematical Books*.

To the Ingenious *Mariner*.

I Here present thee with a *New Kalendar*, wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing too much practised) but to make Things plain and practicable. Here is nothing obscure or difficult to discourage young Beginners (for whom 'tis intended) but all Things treated of with as much Plainness (both of Matter and Method) as possible; and I assure thee were I present to instruct thee, I could by no means render things more intelligible than I have here done. I have endeavoured to omit nothing that might be materially useful, having respect to the design'd bigness of the Volume. The *Contents* are as follow:

The Principles of *Arithmetick*, with which I begin, because I am sensible of the Loss some have been at, that have attempted *Navigation* before they have understood something of it; the *Extraction of the Square and Cube Roots*: In all which I have endeavoured to apply the Examples to Sea Affairs. Some necessary *Geometrical Problems*, useful in *Navigation*. Directions for finding the *Prime, Epact, Moon's Age*, and the *Time of Full Sea* (both according to the ordinary and a more accurate Way) with *Tables* for the same.

Tables of the Sun's Place and Declination, with Directions and Examples to every Case, how to use the Declination to find the Latitude: As also the necessary Tables for correcting the Declination, when the Difference of Longitude is considerable from the Meridian of *London*, for which the said Tables of Declination are calculated. A Table of the Sun's Right Ascension. A Table of the Right Ascension and Declination of some of the principal fixed Stars, with the use of the said Tables in finding the time of a Stars coming to the Meridian; as also Directions at large for Observation of any of the said Stars to find the Latitude of the Place, with Examples in each Case. The Description of the *Sea-Quadrant, Fore-staff* or *Nocturnal*. A Table of Latitude and Longitude of the principal Places on the Sea-Coast, collected from the best Information. Problems of *Plain Sailing* and *Astronomy*, (which that the *Practitioners* might learn two things at once) are wrought both by the *Logarithms*, and *Gunter's Scale*. A large and very useful Table of Difference of *Latitude* and *Departure* to every Degree and Quarter Point of the Compass: With its use in working a *Traverse* in order to keep a Reckoning at Sea. A *Rutter* for the Coast of *Great-Britain, France, Ireland, Spain, Portugal*, &c Shewing the Bearing and Distance from one Place to another. A Table of the *Soundings* coming into the *Channel*, giving the Depth of Water, and Quality of the Ground. Lastly, Directions for sailing into some principal Harbours. By all, or any of which, if thou art any ways profited (as I know thou mayest, if thou wantest Information in any of these Things, and dost but a little carefully animadvert upon what thou readest) I have my End. And thy kind Acceptance hereof will further oblige me,



Who am thy Friend,

Nathaniel Colson.

The Principles of Arithmetick briefly and plainly demonstrated, with the Extraction of the Square and Cube Roots.

BECAUSE of the Usefulness and Necessity of some Knowledge of *Arithmetick*, in the Art of *Navigation*, it is requisite to begin with that, without which no orderly Procedure can be made, and first of

Numeration.

Numeration is that part of *Arithmetick*, whereby one may rightly express the Value of any Number proposed.

All Numbers are expressed by these Characters following.

1, 2, 3, 4, 5, 6, 7, 8, 9, 0,
One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Cypher

Altho' Cyphers signify nothing by themselves, yet being put before (or to the Right Hand of) other Figures, they increase their Value as much as if they were all Figures, as may plainly be seen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thousands	1000
12345	X Thousands	10000
123456	C Thousands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to their Places they are set in, as 1 in the first Place, or Place of *Units*, is *One*; in the second Place *Ten*; in the third Place *One Hundred*; in the fourth Place *One Thousand*; in the fifth Place *Ten Thousand*, &c.

The Table directs how properly to express any given Number; As 123, which Number consisting of three Places, is thus numbred, *One Hundred Twenty Three*; this Number 123456, consisting of six Places, is thus expressed, *One Hundred, Twenty Three Thousand, Four Hundred fifty six*; and this Number 123456789, consisting of nine Places, is thus numbred, *One Hundred twenty three Millions, Four Hundred Fifty six Thousand, Seven Hundred Eighty Nine*.

Addition

Addition is that which of several Sums makes but one Sum.

Example. Suppose four Men (A. B. C. D.) owe me several Sums of Money, I would know how much is due to me in the whole: I begin at the first Row towards the Right Hand and say, 3 and 6 is 9 and 2 is 11, and 4 is 15; setting down the 5 under the Row added up; then I carry the 1 ten to the next Row, saying 1 and 4 is 5, and 5 is 10, and 3 is 13, and 6 is 19; set down 9 under the Row added up, and carry one to the next row, saying, 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; set down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, and 5 is 10, and 3 is 13, which because this is the first row, I set down: So that by this *Addition*, the whole Debt is found to be *Thirteen Thousand, Nine Hundred, Ninety five Pounds.*

A oweth	3564
B	5432
C	3156
D	1843
	13995

Characters used in Arithmetick.

Examp. 2. Suppose I have several Creditors to whom I owe several Sums of Money, I desire to know the whole

Therefore begin again (as always in *Addition*) at the Right-hand, I say 11 and 10 is 21, and 4 is 25, and 6 is 31; now considering how many Shillings there are in 31d. I find 2s. and 7d. wherefore I set down the odd 7d. under the row of Pence, and carry the 2s. to the next row being Shillings, saying 2 and 4 is 6, and 8 is 14, and 9 is 23, and 11 is 34, that is 1l. 14s. set down 14s. and carry the 1l. to the next row, saying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; set down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; set down 2 and carry 1: Lastly, 1 and 1 is 2; so that by this *Addition* the whole Debt is, *Two Hundred Twenty Eight Pounds, Fourteen Shillings and Seven Pence.*

l.	s.	d.
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Examp. 3. Suppose at Sea, keeping my Reckoning in Degrees and Minutes, having six Days Difference of Longitude. I would know how much the whole is.

Say 13 and 2 is 15, and 9 is 24, and 56 is 80 and 6 is 86; now 60 Minutes making a Degree, set down the odd 26 Minutes under the row of Minutes, and carry the 1 Degree to the next row, being Degrees; saying 1 that I carry'd and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7; so that the whole Difference of Longitude made these 6 Days, is 7 Degrees and 26 Minutes.

	Day		
1	1	06	
2	0	56	
3	1	09	
4	2	00	
5	1	02	
6	1	13	
0	7	26	

Subtract-

SUBTRACTION.

7

Subtraction is the taking of a less Sum out of a greater, and finding the Remainder

Example. Suppose a Man oweth me ————— $\begin{array}{r} 376 \\ 211 \\ \hline 165 \end{array}$ $\begin{array}{r} 13 \\ 05 \\ \hline 07 \end{array}$ $\begin{array}{r} 06 \\ 08 \\ \hline 10 \end{array}$

And hath paid me —————

I desire to know what remains unpaid, which is —————

To work this I say, 8 from 6 I cannot, but considering there is 12 Pence contained in a Shilling, I add, 12 to 6, and say 8 from 18, and there remains 10, which set down under the Pence; and then having borrowed 1 I go to the next Row, and say; 1 that I borrowed and 5 is 6, which take out of 13, there remains 7; then proceeding to the Pounds, I say, 1 from 6 there remains 5, and 1 from 7 there remains 6; and lastly, 2 from 3, there remains 1: so there remains due of the said Debt, *One Hundred Sixty Five Pounds, Seven Shillings, Ten Pence.*

Example 2. Suppose the Distance between two Places to be 1000 Miles, and that I have sailed 396, and desire to know how many Miles I have to Sail.

Therefore placing 396, under the 1000, I say, 6 from 0 I cannot, but 6 from 10, there remains 4; proceeding to the next Figure I Miles, say, 1 that I borrowed and 9 is 10, from 0 I cannot, but 10 from 1000 there remains 0: Again, 1 that I borrowed and 3 is 4, from 396 0 I cannot; but 4 from 10, there remains 6: Lastly, 1 that I borrowed from 1, there remains 0: So there remains 604 Miles.

Example 3. Suppose one Place in the Latitude of 51 Deg. 32 Min. and another in the Latitude of 4. Deg. 10 Min. I would know the Difference of Latitude between them.

To do which, subtract the less Latitude out of the greater thus; the lesser being placed undermost, say, 10 from 32, there remains 22, which Place under the Minutes; then for the Degrees, 2 from 1 I cannot, but 2 from 11 there remains 9, then 1 that I borrowed, and 4 is 5, 5 from 5 there remains 0.

So the Difference of Latitude is 9 Deg. 22 Min.

Multiplication.

Multiplication is that which serves instead of many Additions, by which any Number of a greater Denomination is brought into a less, as Pounds into Shillings, and Shillings into Pence, and Pence into Farthings, Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by the Number of the lesser which is contained in the greater, as the multiplying any Number of Pounds by 20 (the Number of Shillings contain'd in a Pound) brings it into Shillings, and so of the rest.

Multiplication consists of Three Parts

1. The Multiplicand, or Number to be multiplied
2. Multiplier, or Number by which to multiply
3. The Product made by the Multiplication.

For the Learner's more ready Procedure herein, it is necessary to insert the Table which is first to be committed to Memory.

The

MULTIPLICATION.

The Multiplication TABLE.

2 times	$\left\{ \begin{array}{c} 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{array} \right\}$	is	$\left\{ \begin{array}{c} 4 \\ 6 \\ 8 \\ 10 \\ 12 \\ 14 \\ 16 \\ 18 \end{array} \right\}$	4 times	$\left\{ \begin{array}{c} 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{array} \right\}$	is	$\left\{ \begin{array}{c} 16 \\ 20 \\ 24 \\ 28 \\ 32 \\ 36 \end{array} \right\}$	7 times	$\left\{ \begin{array}{c} 7 \\ 8 \\ 9 \end{array} \right\}$	is	$\left\{ \begin{array}{c} 49 \\ 56 \\ 63 \end{array} \right\}$
3 times	$\left\{ \begin{array}{c} 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{array} \right\}$	is	$\left\{ \begin{array}{c} 9 \\ 12 \\ 15 \\ 18 \\ 21 \\ 24 \\ 27 \end{array} \right\}$	5 times	$\left\{ \begin{array}{c} 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{array} \right\}$	is	$\left\{ \begin{array}{c} 25 \\ 30 \\ 35 \\ 40 \\ 45 \end{array} \right\}$	8 times	$\left\{ \begin{array}{c} 8 \\ 9 \end{array} \right\}$	is	$\left\{ \begin{array}{c} 64 \\ 72 \end{array} \right\}$
				6 times	$\left\{ \begin{array}{c} 6 \\ 7 \\ 8 \\ 9 \end{array} \right\}$	is	$\left\{ \begin{array}{c} 36 \\ 42 \\ 48 \\ 54 \end{array} \right\}$	9 times	9	is	81
				10 times	10	is	100	10 times	10	is	100

Example 1. I demand how many Shillings there is in 5648 *l*.
 To Answer this, multiply the given Number of Pounds by 20,
 Thus; The first being 0 Cypher, set down 0 underneath the first
 Figure; and then proceed to the next Figure, and say, 2 times 8
 is 16; set down 6 under the second Figure and carry 1; then
 2 times 4 is 8, and 1 that I carried makes 9; then 2 times 6 is
 12, set down 2, and carry 1; lastly, 2 times 5 is 10, and 1 that I carried
 makes 11. So that 5648 *l*. multiply'd by 20, makes 112960 Shillings.

Example 2. In 276 Degrees how many Minutes?

First set down _____ 276
 Then (because 60 Minutes make a Degree) multiply by _____ 60
 The Product is _____ 16560
 So that I find 276 Degrees multiplied by 60, makes 16560 Minutes.

Example 3. Multiply _____ 8765437
 By _____ 32

Product _____ 280493984

Multiply _____ 47632867
 By _____ 4352
 _____ 95265734
 _____ 238164335
 _____ 142898601
 _____ 190531468
 _____ 207298237184

DIVISION.

Division is that which serves in the Room of many *Subtractions* and is
 useful in reducing all Numbers of a lesser Denomination into a greater,
 as Minutes into Degrees, Farthings into Pence, Pence into Shillings, and
 Shillings into Pounds. It consists of Three Parts, (*viz.*) *Dividend* or the
 Num-

Division.

9

Number to be divided ; Divisor, or the Number to divide by ; and the Quotient, also if any Number remain, it is called the Remainder.

Ex. 1. To divide 7834 by 23 : first say, how many times 2 in 7 : Or, how often 23 in 78, the Answer will be 3 times, which place in the Quotient, then multiply the Divisor 23 by 3, the Figure placed in the Quotient, saying, 3 times 3 is 9, and 3 times 2 is 6, and place these under the two first Figures of the Dividend, and draw a Line : subtracting 69 from 78, there rests 9, which set underneath, and place a Point under 3, to shew that it's brought down ; place it to the 9, then proceed, saying, how many times 23 in 93, or how many times 2 in 9 : which will be 4 times ; place 4 in the Quotient, by which multiply the Divisor : Again, placing the Product which is 92 under 93, and draw a Line, and subtract it therefrom, the Remainder 1 put under the Line, and set down 4 the last Figure in the Dividend, putting a Point under it, and place it to the remaining 1 ; then because there remains but 14, being less than the Divisor 23, and so cannot be taken out of it, place a Cypher in the Quotient, and the Work is finished.

$$\begin{array}{r}
 \text{Divisor. Dividend. Quotient.} \\
 23 \quad) \quad 7834 \quad (340 \\
 \underline{69} \\
 93 \\
 \underline{92} \\
 14 \text{ Remainder.}
 \end{array}$$

Examp. 2. In 360 Minutes how many Degrees ? Here I divide by 60, because 60 Minutes make a Degree, and because the last Figure of the Divisor is a Cypher, I cut it off, and with it the last Figure of the Dividend, which is here also a Cypher, and divide 36 by 6, (which is the same thing as to divide 360 by 60) but because 6 cannot be taken out of 3, therefore I say, how many times 6 in 36 ? The Answer is 6 times : which I place in the Quotient, and proceed to multiply the Divisor 6, by the 6 placed in the Quotient, which produceth 36, which subtracted leaves 0, so that by this work it appears, that in 360 Minutes there are 6 Degrees just.

$$\begin{array}{r}
 \text{Divisor. Dividend. Quotient.} \\
 60 \quad) \quad 360 \quad (6 \\
 \underline{36} \\
 00
 \end{array}$$

Example 3. A Ship taken by 253 Men, is valued at 59875 $\frac{1}{2}$. I demand each Man's Share, being equally divided.

Divisor. Dividend. Quotient.

$$\begin{array}{r}
 253 \quad) \quad 39875 \quad (236 \\
 \underline{506} \\
 \times 927 \\
 \underline{759} \\
 1685 \\
 \underline{1518}
 \end{array}$$

167 Remains

$$\begin{array}{r}
 253 \\
 236 \\
 \hline
 1518 \\
 759 \\
 506 \\
 167
 \end{array}$$

Proof 59875

First, say, how many times 2 in 5 ? The Answer is two times, which place in the Quotient ; then multiply the Divisor 253 by 2, the Figure placed

placed in the Quotient, saying 2 times 3 is 6, 2 times 5 is 10, set down 0, and carry 1; 2 times 2 is 4, and 1 is 5, which set down under the 3 first Figures of the *Dividend*, from whence being subtracted, set the Remainder underneath, which will be 92, then take down 7, making a Point underneath, and set it after 92, the Remainder; then say how often 2 in 9, Answer 3 times (for 4 will prove too many.) Then multiply the *Divisor* 253, as before, by 3, the Figure last placed in the Quotient, and the Product will be 759, which being subtracted from the Figures above, the Remainder will be 168, then take down 5, and point it as before, setting it after 168, the last Remainder: And again, ask the Question, how often 2 is contained in 16? Answer 6 times; by which 6, when set in the Quotient, multiply the *Divisor* 253; and the Product is 1518, which place under the last *Dividend*, and subtract therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finish'd, each Man's Share being 236*l.* and 167*l.* over, which is to be divided among them; which may easily be done by multiply 167 by 240, and dividing the Product by 253, gives each Man's Share in Pence. The Proof is by multiplying 253 the *Divisor* by 236 the Quotient; then taking in 167 the Remainder, under the 3 last Figures, the Product will make the same with the *Dividend*, as you see in the Operation.

The Rule of THREE E,

IS that, which having three Numbers given, a fourth Number is found in Proportion thereunto; which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the first, and the Quotient of the said Division is the Answer to the Question.

Example 1. If in 24 Hours a Ship sails 130 Miles; how many Miles will she sail with the same Gale in 192 Hours or eight Days?

Hours	Miles	Hours
24	130	192
		130
		5760
		192
		24960

24	24960	1040 Miles in 192
24	96	Hours
24	96	
24	00	

Here 24 is the first Number, 130 the second, 192 the third; wherefore according to the Rule, I multiply 130 and 192 the second and third Numbers together, and divide the Product thereof 24960, by 24 the first Number. which gives in the Quotient 1040 Miles, which is the Way the Ship will make in 192 Hours the Time proposed.

Example 2. If 1*lb.* of Tobacco cost 6*d.* what will 112*lb.* cost?

112
6
12)672 Pence (or 56 Shillings.)

Here

The Rule of Three.

11

Here the first Number being an Unit, which neither multiplies more divides, it saves the Labour of Division, and the Answer is 672*d.* (for the Answer will be of the same Name with the second Number) which divided by 12 to bring them into Shillings, gives the Quotient 56*s.* which is the Price of 112*lb.* as required.

Example 3. If a Staff of 3 Y ards long give a Shadow of 2 Yards: How high is that Castle whose Shado w is 100 Foot?

Which Question, for the more ready Solution, state thus :

If 6 Foot (which is 2 Yards) give 9 Foot, what shall 100 Foot give ?

By the Operation it appears, the said

Castle must be 150 Foot high.

$$\begin{array}{r} 9 \\ 6 \overline{) 900} 150 \text{ Foot} \\ \underline{6} \\ 30 \\ \underline{30} \\ 00 \end{array}$$

Example 4. If 564*l.* 12*s.* 6*d.* is to be divided between 165 Men, how much is one Man's Share ?

First, reduce it all into Pence, by multiplying 564 by 20 (the Shillings in one Pound) taking in the 12 Shillings, as you are taught in Multiplication, and the Sum 11292 multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564*l.* 12*s.* 6*d.* Then say,

If 165 Men have 135510 Pence, how many shall one Man have? And here you should multiply 135510 by the last Number, but here it is 1, which will neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling) gives 68 Shillings, and the 5 remaining are 5 Pence to each Man's Share.

Note, The 45 remaining of the first Division is only $\frac{45}{12}$ of one Penny. which is little more than a Farthing.

The Operation follows.

$$\begin{array}{r} 564 \text{ l. } 12 \text{ s. } 6 \text{ d.} \\ \underline{20} \\ 11292 \\ \underline{12} \\ 22590 \\ 11292 \\ \hline 165 \overline{) 135510} (821 \text{ Pence} \\ \underline{1320} \\ 351 \\ \underline{330} \\ 210 \\ \underline{165} \\ 45 \end{array}$$

$$\begin{array}{r} 12 \overline{) 821} (68 \text{ Shillings, equal} \\ \underline{72} \text{ to } 3 \text{ l. } 8 \text{ s. } 5 \text{ d.} \\ 101 \\ \underline{96} \\ 5 \text{ Pence.} \end{array}$$

B 2

Note,

The Extraction of the Square Root.

Note, That in the *Rule of Three*, the first and third Number must be both of one Denomination, and the second must be brought into the lowest Value expressed therein, as in the foregoing Example, I work not the Question as it was first stated, but transposing the Numbers, I put the Denomination of Men first and last, and the Money in the midst, to answer to that part of the Rule, which requires the first and third Numbers to be both of one Name. The Answer thereof in the preceding Question, as by the Operation appears, is 821 Pence: which reduced into Shillings, is 68s. and 5d. or 3l. 8s. and 5d. which is one Man's Share, which was required.

The next thing I shall briefly treat of, is *The Extraction of the Square and Cube Roots*, as also somewhat of their Use.

The Extraction of the Square Root.

Ex. 1. **T**O extract the Square Root of 7056

proceed thus: First point the given Numbers (that is, put a prick over every other Figure beginning at the first Figure at the Right-hand, and note by the way, that so many Points as the said Number admits over it, of so many Figures consists the Root of the said Number, then proceed, seeking the greatest square Number (which is a Number multiplied by itself) in the first Point towards the Left-hand (70) which is 64 constituted of 8 multiplied into it self; for 8 times 8 is 64. The Root of the Square Number, which is 8, place in the Quotient, and subscribe the square Number (64) under the said first Point, subtracting it therefrom, and setting down the Remainder (6) underneath: To this Remainder bring down the next Point (56) then drawing a crooked Line, on the Left hand of the Dividend (656) double the Quotient, and place it (*viz.* 16.) therein, calling it the Divisor, seek how often the Divisor is contained in all the Figures of the Dividend, save the last to the Right-hand: (*viz.*) How many times 16 in 65? The answer is 4 times, which place in the Quotient, and also on the Right-hand of the Divisor (16) then multiply the Divisor (164) by the 4 last placed in the Quotient, and put the Product, which is 656, under the Dividend, subtracting it therefrom; which done, nothing remains: So that the Square Root of 7056 is 84.

7056(84 Root	
64	

164(656 Divisor	
656	

000	

The Square Root is applied to Navigation, as follows:

Any two sides of a Right-angled Plain Triangle being given, the third is found by the Extraction of the Square Root.

Example 2. Suppose a Ship to have made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Distance to be required, the said Distance is found by the Extraction of the Square Root, as follows.

The Rule. Square the Difference of Latitude and Departure severally (that is, multiply each by it self) and from the Sum of both the Squares added together, extract the Square Root, which will be the Distance required.

Example

Extraction of the Square Root.

13

Example.

Difference of Lat. 87.	The Departure 71.	Square Diff. Lat. — 7569
Multiplied by it self 87.	Multipl. by it self 71.	Square Departure — 5041
609	71	Their Sum 12610
696	497	
The Square — 7569	The Square 5041	

By this Operation it appears, that the Distance, omitting the Fraction, is 112 Miles.

12610(112, the Distance req.
 1
 21)26
 21
 222) 510
 444
 66

Examp. 2. Suppose a Ship's Distance to be 111 Miles, and her Departure 57 Miles, and the Difference of Latitude to be required; the said Difference of Latitude is found by the Extraction of the Square Root, as follows.

The Rule. From the Square of the Distance subtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required.

Example. The Distance — 111 — The Departure — 57
 Multiplied by it self — 111 — Multiplied by it self — 57

	111		399
	111		285
	111	Sq. of Departure —	3249
Square of the Distance	12321	.	.
Square of Dep. subtract	3249	9072(95 Diff. Lat. required.	
Remains	9072	81	
	185)972		
	925		
	47		

The Difference of Latitude, as by the Operation appears, is 95 Miles, omitting Fractions.

If the Departure be required, the Rule is, from the Square of the Distance, subtract the Square of the Difference of Latitude, and the Square Root of the Remainder is the Departure required. The Operation for Brevity-sake is omitted.

Having proceeded thus far in shewing the *Practitioner* how to find the Distance, Difference of Latitude and Departure (any two of them being given) without *Trigonometry*, I shall shew the manner of finding the Course exact enough for common Use, without the said Operation, which is done as follows:

The Proportion to find the Course. As the Sum of the Hypotenuse (or Distance and half the greater of the other 2 Legs (*viz.*) if the Difference of

14 The Use of the Extraction of the Square Root.

of Latitude be most, half that, but if the Departure be most, half that : I say ; As the Sum of these two is in Proportion to the lesser (or remaining) Leg, so is 86 to the Angle (in Degrees) opposite to the less Leg ; which is the Course, when the Departure is less than the Difference of Latitude, otherwise 'tis the Complement of the Course.

Examp. Admit a Ship's Distance to be 110 ; the Difference of Latitude to be 88, and the Departure 66, and the Course required.

First, add the Distance, and half the greater Leg into one Sum.

The Distance is — — — — 110
Half the greater Leg (88) is — — — 44
The Sum — — — — 154

Having thus done, say by the *Rule of Three*.

As the said Sum 154 is to 66 the lesser Leg, so is 86 to the Course.

To bring out the odd Minutes, multiply the Remainder of the Division 132 by 60, (the Number of Minutes contained in a Degree) and divide the Product by the *Divisor* (154) and the Quotient of the said *Division* gives for the Answer 51 Minutes ; So that the Course required is 36 deg. 51 minutes.

$$\begin{array}{r} 66 \\ 516 \\ \hline 516 \\ \hline 154)5676(36 \text{ deg. } 51 \text{ min.} \\ 462 \\ \hline 1056 \\ 924 \\ \hline 132 \end{array} \quad \begin{array}{r} 132 \\ 60 \\ \hline 154)7920(51 \\ 770 \\ \hline 220 \end{array}$$

Example 3. Extraction of the Square Root. Suppose a Rope of 5 Inches Compass, and another Rope of double the Strength is required. The Dimensions of the said required Rope are found by the *Extraction of the Square Root* : For should it be supposed that a Rope of 10 Inches Compass, is but double the Strength of a Rope of 5 Inches ; upon Proof it is manifestly false, for the said Rope of 10 Inches is 4 times the Strength of that of 5.

The Rule. Take the Compass of the given Rope (*viz.* 5.) and multiply that by itself ; which Product (because the other Rope is to be twice as strong) multiply it by 2, and the Square Root of the Product is the Compass of the Rope required.

Example. The given Rope's Compass 5 Inches, Extract the Root 50(7
Multiplied by itself ——— 5
The Square ——— 25
Multiplied by ——— 2
50

So that by the Operation it appears a Rope to be twice the Strength of the given Rope of 5 Inches Compass, must be 7 Inches and a little better.

If it's desired to know the Weight of one Rope by another, 'tis as follows.

The Proportion is, As the Square of the Compass of the one Rope is to the Square of the Compass of the other ; so is the Weight of the one to the Weight of the other, Length for Length : *Ex.* Suppose a Cable of 10 Inches to weigh 25 Hundred, and the Weight of a Cable of 8 Inches required. Say, as 100 (the Square of 10) is to 64 the Square of 8 : so is 25 C. the Weight of one Cable to 16 C. the Weight of the other required. *Ex-*

Extraction of the Cube Root.

15

Extraction of the Cube Root.

I shall first, as necessary, insert a Table of the Cubes of the Nine Digits, which ought to be committed to Memory.

Cubes of the Nine Digits	1	001	4	064	7	343
	2	008	5	125	8	512
	3	027	6	216	9	729

Example 1. Extract the Cube Root of 12167

First, Point the given Number (*i. e.*) put a Prick over every third Figure (beginning at the Right Hand) then seek the greatest Cube in the first Point (*viz.* 12.) which is 8, the Cube Root whereof (which is 2) place in the Quotient; subtract the Cube (8) from the first Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this the *Resolvend*, then draw a Line underneath it, then square the Quotient 2, which is 4; multiply the said Square (4) by 300, which makes 1200; place this under the *Resolvend*, and call it the *Triple Square*. Again, multiply the Quotient (2) by 30, which makes 60; place this under the *Triple Square*, and call it the *Triple Quotient*; add these two, (*viz.*) *Triple Square* and *Triple Quotient* into one Sum, and call it the *Divisor*; seek how often this *Divisor* is contained in the *Resolvend*, which is three Times; which 3 placed in the Quotient, multiply the *Triple Square* by the Figure 3 last placed in the Quotient, and subscribe the Product underneath the *Divisor*; square the said Figure (3) last placed in the Quotient, and thereby multiply the *Triple Quotient*, and place it underneath the last Product: Cube the Figure (3) last placed in the Quotient, and place it under the preceding Products. Lastly, add these three Products into one Sum, subtracting the said Sum from the *Resolvend*, subscribe the Remainder; to which Remainder had there been any more Figures, the next Point must have been brought down, and the preceding Work repeated from the Squaring of the Quotient, until all the Figures are so brought down; but in this Example there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167 appears to be 23, nothing remaining.

12167	(23 Root
8	
4167	<i>Resolvend</i>
1200	<i>Triple Square</i>
60	<i>Triple Quotient</i>
1260	<i>Divisor</i>
3600	
540	
27	
4167	
000	

Example 2. applied. Suppose a Ship of 300 Tun, 75 Foot by the Keel, 29 Foot and a half at the Beam, and 14 Foot deep in the Hold; another Ship is desired of the same Mould and Shape of 500 Tuns, the several Dimensions of the Ship are found by the Extraction of the Cube Root.

Example. Beginning with the Keel. First, Cube the Length of the given Keel, which is done by multiplying it into itself, and then multiplying the Product by it again.

Then

Then say by the Rule of Three: As 300 Tun the one Ship's Burthen; to 500 Tun the other Ship's Burthen; so is 421875 the Cube of one Ship's Keel's Length, to the Cube of the other Keel's Length. Which being wrought by the Rule of Three, gives 703125: From which extract the Cube Root, and that will be the Length of the Keel required.

In this Extraction 3 Cyphers are added to bring out the Fraction, the Operation therewith being the same as if there had been more Figures in the proposed Number; the Operation gives for the Length of the Keel required 88 Foot $\frac{2}{3}$ Parts.

Thus, having found one of the Dimensions, the rest may be found without the Extraction of the Root, by the Rule of Three

Thus, suppose the next thing I would find be her Breadth by the Beam, say, as the Length of the one Ship's Keel 75, is to the Length of the other 89 fere: So 29 $\frac{1}{2}$ Foot, the Breadth of the one Ship by the Beam, to the Breadth of the other, which by the Rule of Three, gives 35 Foot $\frac{3}{4}$. So you may find the Depth in the Hold, &c.

Example 3. Suppose an Iron Shot 4 Inches Diameter to weigh 9lb. and the Diameter of a Shot of any other Weight, suppose of 72lb required. This is also done by the Extraction of the Cube Root, as follows:

First, say, by the Rule of Three,

As 9lb the Weight of one Shot, to 72lb. the Weight of the other; so is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter; which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

$$\begin{array}{r}
 75 \text{ given Keel} \\
 75 \\
 \hline
 375 \\
 525 \\
 \hline
 5625 \\
 75 \\
 \hline
 28125 \\
 39375 \\
 \hline
 421875 \text{ Cube given Keel}
 \end{array}$$

$$\begin{array}{r}
 703125 (88\frac{2}{3} \text{ Root} \\
 512 \\
 \hline
 191125 \text{ Resolvend} \\
 19200 \text{ Triple Square} \\
 240 \text{ Triple Quotient} \\
 \hline
 19440 \text{ Divisor} \\
 153600 \\
 15360 \\
 \hline
 512 \\
 169472 \\
 \hline
 21652000 \text{ Resolvend} \\
 2323200 \text{ Triple Square} \\
 2640 \text{ Tr. Quotient} \\
 \hline
 2325840 \text{ Divisor} \\
 20908800 \\
 213840 \\
 \hline
 729 \\
 21123369 \\
 \hline
 529631 \text{ Remainder}
 \end{array}$$

But if it were required to find the Weight of a Shot by the Diameter, 'tis done thus, by the Rule of Three.

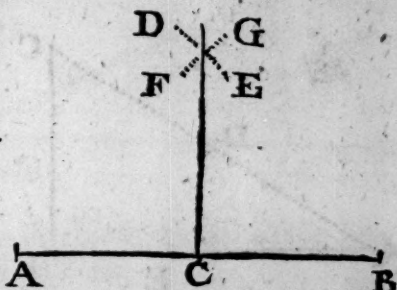
As the Cube of one Shot's Diameter, to the Cube of the other: So is the Weight of the one Shot, to the Weight of the other required.

And thus much for the *Arithmetical Part* of this Treatise.

Some

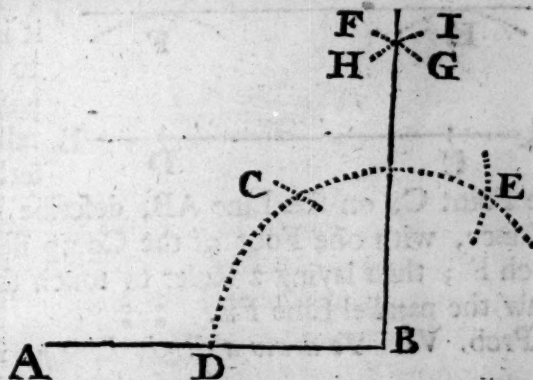
Prob. I. To raise a Perpendicular from any Point proposed, in a given Right Line.

LET the Line given be AB, and the Perpendicular to be raised from the Point C; to do which set off the two equal Distances CA and CB. Then the Compasses being opened to any convenient Distance bigger than AC or CB, with one Foot of the Compasses in the Point A, describe the Arch DE; then with the same Extent, and one Foot in the Point B, describe the Arch FG, then draw the Perpendicular from the Point C, thro' the Intersection, (or cutting) of the two Arches FG and DE, which was required.



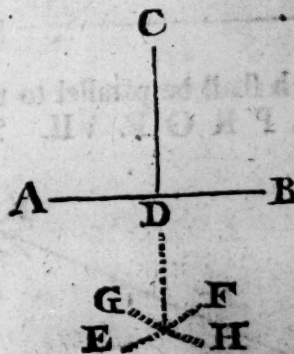
Prob. II. To raise a Perpendicular on the End of a Line.

Let the Line given be AB, the Perpendicular to be raised from the Point B, to do which, with one Foot of the Compasses at B, with any convenient distance, as BD, sweep an Arch; then with the same Extent, one Foot of the Compasses being in the Point D, mark the said Arch at the Point C, and one Foot being at C, mark it at E, then with the same distance, one Foot of the Compasses being in the point C, describe the Arch FG; and placing the Compasses in the Point E, describe the Arch HI; then from the Point B, and through the Intersection of the two Arches FG and HI, draw the Perpendicular which was required.

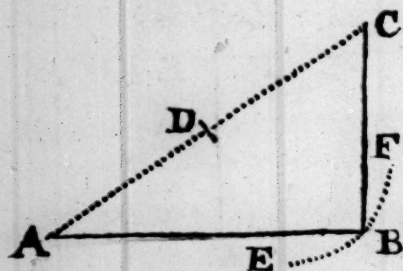


Prob. III. To let fall a Perpendicular from a Point assigned over a given Right Line.

Let AB be the Line given, C the Point over the Line from which the Perpendicular is to fall; to do which, place one Foot of the Compasses in the point C, then opening them to a convenient distance, mark the Line AB in two Points with the said distance, as in the Points A and B; then with one Foot of the Compasses in the Point A, describe the Arch EF, and with one Foot in the Point B, describe the Arch GH; then from the Point C, and thro' the Intersection of the said two Arches, draw the Perpendicular CD, which was required.



Prob. IV. *Another way to let fall a Perpendicular from a given Point on a given Right Line.*



Let the Line given be AB, upon which let it be required to let fall a Perpendicular from the Point C; to do which, from the Point assigned C, draw the Line CA; which Line divide into two equal Parts, as in the Point D; then one Point of the Compasses resting in the Point D, with the same distance, (*viz.* of half the Line AC) describe the Arch EF; then from the Point C, to the Intersection of the Arch EF with the Line AB, draw the Perpendicular CB.

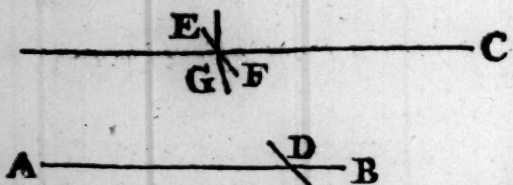
Prob. V. *To draw a Line parallel to a Line given.*



Let AB be a Line given, to which it is required to draw a Line parallel; to do which, first take in the Compasses the distance at which the parallel Line is to be drawn, and then setting one Foot of the Compasses in the Point C, on the Line AB, describe the Arch E; and with the same distance, with one Foot of the Compasses in the Point D, describe the Arch F; then laying a Ruler to touch the Convexity of the two Arches, draw the parallel Line FE.

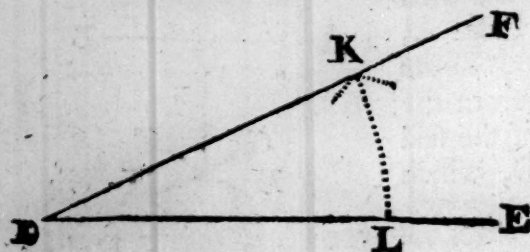
Prob. VI. *To draw a Right Line parallel to a given one, that shall pass thro' a point given.*

Suppose AB the given Line, and it's required to draw a Line parallel thereto, that shall pass thro' a given Point, as C.



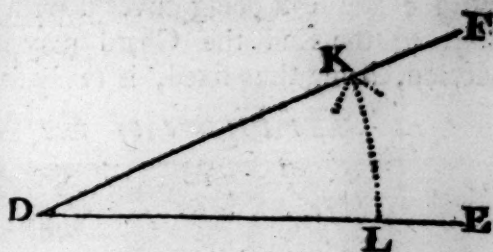
Set one Foot of the Compasses in C, with the other at any distance, cross AB in D, and with that distance from any Point as A, of the Line AB describe an Arch EF; then from C with the distance AD cross the Arch in G; and draw the Line CG, which shall be parallel to the given Line AB, as was required.

P R O B. VII. *To make an Angle equal to any Angle given.*



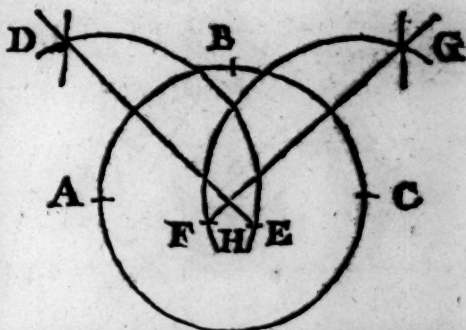
Suppose FDE an Angle given, and it is required to make another Angle equal thereto: To do this, first draw the Line DE, then with any convenient distance less than DE, describe the Arch KL, then placing the Compasses at D, with the same distance which swept the Arch

Arch KL sweep the Arch KL; take the Arch KL in the Compasses, and setting one Foot in the Point L, cross the Arch LK in the Point K, then through the Point K draw the Line DKF, then is the Angle EDF equal to the Angle EDF, as was required.



Prob. VIII. To bring any three Points not situate in a Right Line, into the Circumference of a Circle.

Let the three Points thro' which the Circle is to pass be ABC: Take above half the distance between the two Points A and B in the Compasses; and one Foot of the Compasses being in the Point A, with the said distance describe the Arch ED; and with the same distance, one Foot of the Compasses being in the Point B, mark the Arch ED in the Points E and D, and draw the right Line ED;



then take above half the distance between the Points C and B in the Compasses, and one Foot of the Compasses being in the Point C, with the said distance describe the Arch FG; and with the same distance, one Foot of the Compasses being in the Point B, mark the Arch FG, in the Points F and G, and draw the Right Line FG. Now where the two Right Lines DE and FG, being continued, intersect each other (*viz.* in the Point H) is the Center of the Circle, which was required.

The Description of the Mariner's Compass.

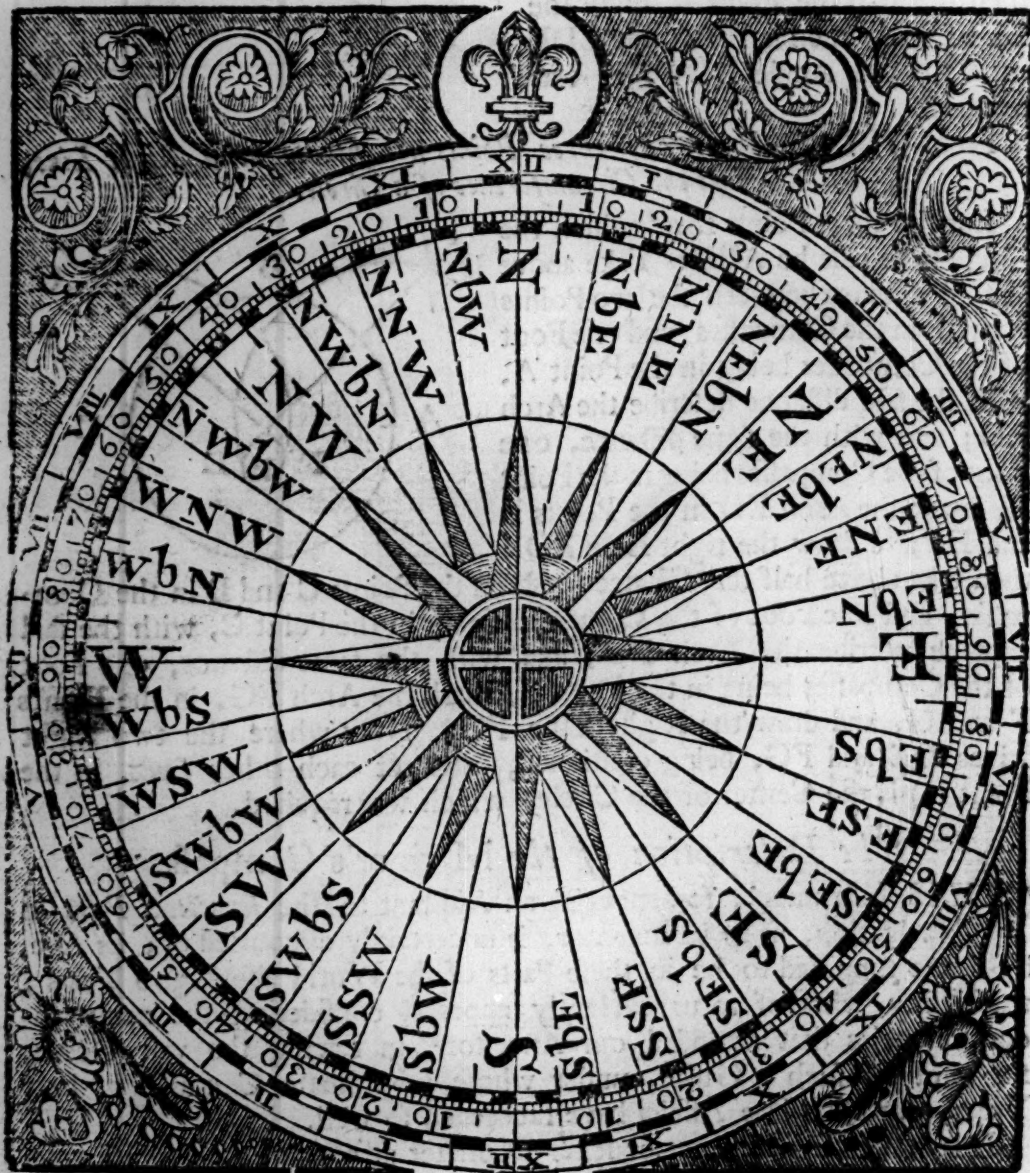
THIS Instrument, so beneficial an Assistant to the *Practical Part* in Navigation, as to its Inventor, is uncertainly discoursed of; its Age, by some supposed to be in these Parts of the World about 300 Years; the Utility whereof to us evidently appears, considering the many Inconveniencies that attended our Ancestors, in tracing the vast Ocean, for want of such a Guide, under whose subordinate Conduct of later Years, our Maritime Affairs have succeeded so well.

It is a Circle of greater or lesser Diameter at pleasure, described upon a Paste-board, and divided into 360 Degrees, and 32 Points, (and sometimes into 24 Hours) each Point containing 11 deg. 15 min. or 3 quarters of an Hour; as in the following Figure.

The Circle being thus divided upon the Chard or Paste board, there are pasted on the other Side of the said Chard or Paste-board, two Wires, which Wires being touched with the Loadstone, and the Chard hung at the Center upon a Pin, fix'd in a Box, its Position becomes North or South; and

and the said Box being cover'd with a Glass, and hung in another square Box, to the End the Chard may traverse notwithstanding the Ship's Motion, being thus fixed, is ready for Use.

The Figure of the Mariner's Compass.



To find the Prime or Golden Number.

THE Prime or Golden Number, is a Revolution of nineteen Years, in which Term the Moon returns to make the same Aspects with the Sun on the same Day of the Month (most commonly) that they were on Nineteen Years before.

To find which, add 1 to the Year of our Lord, and divide by 19, the Remainder is the Prime or Golden Number, but if nothing remains, the Prime is 19.

Example.

Example. To find the *Golden Number* for the Year 1746, add 1 which makes 1747; which divide by 19

$$\begin{array}{r} 19 \overline{) 1747 (91} \\ \underline{171} \\ 37 \\ \underline{19} \\ 18 \end{array}$$

The Remainder 18 is the *Golden Number* for the Year 1746.

To find the *Epaet*.

THE *Epaet* is the Number of Days that the *Solar Year* of 365 Days exceeds the *Lunar Year* (or 12 Revolutions of the Moon to the Sun) of 354 Days, the Difference being 11 Days: When the *Golden Number* is 1, the *Epaet* is 11; when 21, the *Epaet* is twice 11 or 22; when 3, thrice 11 or 33 (rejecting 30) that is 3, &c. and it is thus found: Divide the Prime by 3, if 0 remain, the *Epaet* is the same with the Prime; if 1 remain add 10, if 2 add 20 to the Prime, the Sum (rejecting 30, if need be) is the *Epaet*.

Exampl. In the Year 1759, the *Golden Number* is 12; which divide by 3 there remains 0; which shews the *Epaet* is 12, the same with the Prime.

In the Year 1748, the *Golden Number* is 1, which added to 10 (because 1 cannot be divided by 1) makes 11 for the *Epaet*.

In the Year 1743, the *Golden Number* is 15, which divided by 3, there remains 0, therefore the *Epaet* is 15, the same with the *Golden Number*.

Or, Multiply the *Golden Number* by 11, and divide the Product by 30, the Remainder is the *Epaet*.

To find the *Moon's Age*.

ADD to the *Epaet* for March 1, for April 2, for May 3, for June 4, for July 5, for August 6, for September 7, for October 8, for November 10, for December 10, for January 0, for February 2.

Having added to the *Epaet* the Number for the Month, according to the Rule foregoing, add thereto the Day of the Month, for which the Moon's Age is required: these three Sums added together, if less than 30, is the Moon's Age; if more than 30, then divide it by 30, the Remainder is the Age of the Moon. The Moon's Age subtracted from 30, leaves the Day of the Change. Again, 15 added to, or subtracted from the Day of the Change, leaves the Day of Full Moon.

Example. Suppose it were requir'd to find the Moon's Age for the first Day of April, 1746.

First, Set down the *Epaet* for that Year ——— 18

To which add the Number for the Month, which is ——— 2

To that add the Day of the Month, which is ——— 1

Sum, gives the Moon's Age ——— 21

Then out of 30

Take ——— 21 The Moon's Age.

Remains ——— 09 Days to Change

Add ——— 15

Makes ——— 24 Days to the Full Moon.

To

A Table of the Moon's Age for the Year 1744. 23

Months	D.	H.	Months.	D.	H.
January {			July {		
New moon	3	8 A	First quart.	5	5 A
First quart.	11	8 A	Full moon	13	2 A
Full moon	18	11 M	Last quart.	21	3 A
Last quart.	25	11 M	New moon	28	8 M
February {			August {		
New moon	2	3 A	First quart.	4	4 M
First quart.	10	6 M	Full moon	12	5 M
Full moon	16	10 A	Last quart.	19	mid.
Last quart.	24	4 M	New moon	26	4 A
March {			September {		
New moon	3	8 M	First quart.	2	4 A
First quart.	10	2 A	Full moon	10	9 A
Full moon	17	9 M	Last quart.	18	8 M
Last quart.	24	mid.	New moon	25	1 M
April {			October {		
New moon	1	10 A	First quart.	2	10 M
First quart.	8	9 A	Full moon	10	1 A
Full moon	15	8 A	Last quart.	17	4 A
Last quart.	23	6 A	New moon	24	1 A
May {			November {		
New moon	1	9 M	First quart.	1	8 M
First quart.	8	3 M	Full moon	9	3 M
Full moon	15	9 M	Last quart.	15	mid.
Last quart.	23	1 A	New moon	23	3 M
New moon	30	6 A			
June {			December {		
First quart.	6	9 M	First quart.	1	6 M
Full moon	13	11 A	Full moon	8	4 A
Last quart.	22	3 M	Last quart.	15	9 M
New moon	29	1 M	New moon	22	8 A
			First quart.	31	1 M

Four Eclipses this Year, two of each Luminary.

The First will be of the Sun, *April* the 1st, invisible.

The Second will be of the Moon, *April* the 15th, visible 9 Digits.

The third will be of the Sun, *September* the 24th, invisible.

The fourth will be of the Moon, *October* the 10th, invisible.

24 *A Table of the Moon's Age for the Year 1745.*

Months		D. H.		Months		D. H.	
January	Full moon	7	4 M	July	Full moon	2	4 A
	Last quart.	13	7 A		Last quart.	10	7 A
	New moon	21	3 A		New moon	18	1 M
	First quart.	29	6 A		First quart.	24	4 A
February	Full moon	5	2 A	August	Full moon	1	6 M
	Last quart.	12	7 M		Last quart.	9	10 M
	New moon	20	9 M		New moon	16	9 M
	First quart.	28	7 M		First quart.	22	mid
March	Full moon	6	11 A		Full moon	30	10 A
	Last quart.	13	10 A	September	Last quart.	7	11 A
	New moon	22	3 M		New moon	14	5 A
	First quart.	29	6 A		First quart.	21	noon
April	Full moon	5	8 M		Full moon	29	3 A
	Last quart.	12	4 A	October	Last quart.	7	10 M
	New moon	20	6 A		New moon	14	3 M
	First quart.	28	1 M		First quart.	21	4 M
May	Full moon	4	6 A		Full moon	29	9 M
	Last quart.	12	8 M	November	Last quart.	5	3 A
	New moon	20	7 M		New moon	12	1 A
	First quart.	27	6 M		First quart.	19	mid
June	Full moon	3	5 M		Full moon	28	1 M
	Last quart.	12	4 M	December	Last quart.	5	4 M
	New moon	18	4 A		New moon	12	2 M
	First quart.	25	10 M		First quart.	19	9 A
					Full moon	27	4 A

There will be two Eclipses this Year, both of the Sun.

The first will be on *March* the 21st, visible.

The second will be on *September* the 14th, invisible.

A Table of the Moon's Age for the Year 1746. - 25

Months	D. H.		Months.	D. H.	
January {	Last quart.	3 1 A	July {	New moon	7 2 M
	New moon	10 5 A		First quart.	14 1 M
	First quart.	18 7 A		Full moon	21 11 A
	Full moon	25 5 M		Last quart.	29 10 A
February {	Last quart.	1 10 A	August {	New moon	5 mid.
	New moon	8 10 M		First quart.	12 6 A
	First quart.	17 3 A		Full moon	19 mid.
	Full moon	24 4 A		Last quart.	28 3 M
March {	Last quart.	3 7 M	September {	New moon	4 9 M
	New moon	11 3 M		First quart.	10 mid.
	First quart.	19 6 M		Full moon	18 4 A
	Full moon	26 1 M		Last quart.	26 8 A
April {	Last quart.	1 7 A	October {	New moon	3 1 A
	New moon	9 9 A		First quart.	10 10 M
	First quart.	17 6 A		Full moon	18 9 M
	Full moon	24 9 M		Last quart.	26 10 M
May {	Last quart.	1 8 M	November {	New moon	2 4 M
	New moon	9 noon		First quart.	8 mid.
	First quart.	17 2 M		Full moon	17 4 M
	Full moon	23 5 A		Last quart.	24 11 A
	Last quart.	30 mid.	December {	New moon	1 2 A
June {	New moon	8 2 M		First quart.	8 6 A
	First quart.	15 8 M		Full moon	16 10 A
	Full moon	22 1 M		Last quart.	24 9 M
	Last quart.	29 5 A		New moon	31 2 M

There will be four Eclipses this Year.

The First is *Feb.* 24, at 4 aft. invisible, for the Eclipse ends 23' e'er the Moon rises, two-thirds of the γ Diam. on the lower side will be darkned.

The Second is of the Sun invisible, on *March* the 11th at 2 in the Morn.

The third is of the Moon, visible at *London* the 19th of *August* at Midnight, six Digits on the upper Side.

The fourth Eclipse is of the Sun, on *September* the 4th, at 9 in the Morning invisible, by reason of the Moon's great South Latitude.

26 *A Table of the Moon's Age for the Year 1747.*

Months		D.	H.	Months		D.	H.
January	First quart.	7	1 A	July	First quart.	4	8 M
	Full moon	15	4 A		Full moon	10	11 A
	Last quart.	22	5 A		Last quart.	18	6 M
	New moon	29	3 A		New moon	26	9 M
February	First quart.	6	11 M	August	First quart.	2	2 A
	Full moon	14	5 M		Full moon	9	5 M
	Last quart.	21	1 M		Last quart.	16	11 A
	New moon	28	4 M		New moon	24	9 A
March	First quart.	8	8 M	September	First quart.	31	9 A
	Full moon	15	5 A		Full moon	7	8 A
	Last quart.	22	9 M		Last quart.	15	6 A
	New moon	29	9 A		New moon	23	9 M
April	First quart.	7	2 M	October	First quart.	30	2 M
	Full moon	14	2 M		Full moon.	7	10 M
	Last quart.	20	6 A		Last quart.	15	2 A
	New moon	28	1 A		New moon	22	8 A
May	First quart.	6	4 A	November	First quart.	29	11 M
	Full moon	13	9 M		Full moon	6	3 M
	Last quart.	20	4 M		Last quart.	14	6 M
	New moon	28	4 M		New moon	21	8 M
June	First quart.	5	1 M	December	First quart.	27	10 M
	Full moon	11	4 A		Full moon	5	10 A
	Last quart.	18	3 A		Last quart.	13	10 A
	New moon	26	7 A		New moon	20	5 A
					First quart.	27	1 A

Six Eclipses this Year, four of the Sun, and two of the Moon.

The First will be of the Sun, *Jan.* the 29th, invisible.

The Second will be of the Moon, *Feb.* the 13th, visible and total.

The third will be of the Sun, *July* the 26th, invisible.

The Fourth will be of the Moon, *August* the 9th, invisible.

The Fifth will be of the Sun, *August* the 24th, invisible.

The Sixth will be of the Sun, *September* the 23d, invisible.

A Table of the Moon's Age for the Year 1748. 27

Months		D	H.		Months	D.	H.
January	Full moon	4	6 A		July	Last quart.	6 10 M
	Last quart.	12	11 M			New moon	14 11 M
	New moon	19	3 M			First quart.	22 5 M
	First quart.	26	8 M			Full moon	28 mid.
February	Full moon	3	noon		August	Last quart.	4 11 A
	Last quart.	10	10 A			New moon	13 5 M
	New moon	17	3 A			First quart.	20 5 A
	First quart.	25	3 M			Full moon	27 8 M
March	Full moon	4	4 M		September	Last quart.	3 3 A
	Last quart.	11	6 M			New moon	11 6 A
	New moon	18	3 M			First quart.	18 mid.
	First quart.	25	12 A			Full moon	25 6 A
April	Full moon	2	4 A		October	Last quart.	3 10 M
	Last quart.	9	noon			New moon	11 8 M
	New moon	16	4 A			First quart.	18 6 M
	First quart.	24	6 A			Full moon	25 7 M
May	Full moon	2	2 M		November	Last quart.	2 7 M
	Last quart.	8	6 A			New moon	9 8 A
	New moon	16	5 M			First quart.	16 2 A
	First quart.	24	9 M			Full moon	23 11 A
June	Full moon	31	9 M		December	Last quart.	2 3 M
	Last quart.	6	mid.			New moon	9 8 M
	New moon	14	8 A			First quart.	15 11 A
	First quart.	22	9 A			Full moon	23 5 A
	Full moon	29	5 A			Last quart.	31 9 A

Four Eclipses this Year, two of the Sun and two of the Moon.

The First is of the Sun, *January* the 18th, invisible.

The Second is of the Moon, *February* the 3d, invisible.

The third is of the Sun, *July* the 14th, visible 10 Digits

The Fourth is of the Moon, *July* the 28th, visible 6 Digits.

28 *A Table of the Moon's Age for the Year 1749.*

Months		D. H.		Months		D. H.	
January	New moon	7	7 A	July	New moon	3	1 A
	First quart.	14	noon		First quart.	11	4 A
	Full moon	22	1 A		Full moon	18	9 A
	Last quart.	30	1 A		Last quart.	25	8 M
February	New moon	6	5 M	August	New moon	2	3 M
	First quart.	13	4 M		First quart.	10	6 M
	Full moon	21	7 M		Full moon	16	12 A
	Last quart.	28	12 A		Last quart.	23	7 A
March	New moon	7	3 A	September	New moon	31	7 A
	First quart.	14	5 A		First quart.	8	5 A
	Full moon	22	11 A		Full moon	15	8 M
	Last quart.	30	8 M		Last quart.	22	9 M
April	New moon	6	1 M	October	New moon	30	noon
	First quart.	13	2 A		First quart.	8	2 M
	Full moon	21	1 A		Full moon	14	6 A
	Last quart.	28	2 A		Last quart.	22	1 M
May	New moon	5	11 M	November	New moon	30	5 M
	First quart.	13	8 M		First quart.	6	10 M
	Full moon	20	12 A		Full moon	13	6 M
	Last quart.	27	7 A		Last quart.	20	9 A
June	New moon	3	11 A	December	New moon	28	8 A
	First quart.	12	1 M		First quart.	5	6 A
	Full moon	19	9 M		Full moon	12	8 A
	Last quart.	26	1 M		Last quart.	20	8 A
					New moon	28	10 M

Five Eclipses this Year, three of the Sun and two of the Moon.

The first will be of the Sun, *Jan.* the 7th, invisible.

The Second will be of the Moon, *June* the 19th, invisible.

The Third will be of the Sun, *July* the 3d, invisible.

The fourth will be of the Moon, *Decemb.* the 12th, visible 6 Digits.

The Fifth will be of the Sun, *Decemb.* the 28th, visible 8 Digits.

A Table of the Moon's Age for the Year 1750. 29

Months	D.	H.	Months	D.	H.
January {	First quart.	4 4M	July {	Full moon	8 8M
	Full moon	11 1 A		Last quart.	15 3M
	Last quart.	19 5 A		New moon	22 7M
	New moon	26 10 A		First quart.	30 9M
February {	First quart.	2 2 A	August {	Full moon	6 5 A
	Full moon	10 7M		Last quart.	13 8M
	Last quart.	18 11M		New moon	20 9 A
	New moon	25 8M		First quart.	28 12 A
March {	First quart.	3 12 A	September {	Full moon	5 1M
	Full moon	11 12 A		Last quart.	11 4 A
	Last quart.	20 1M		New moon	19 noon
	New moon	26 4 A		First quart.	27 2 A
April {	First quart.	2 2 A	October {	Full moon	4 10M
	Full moon	10 5 A		Last quart.	11 4M
	Last quart.	18 10M		New moon	19 8M
	New moon	24 12 A		First quart.	27 3M
May {	First quart.	2 5M	November {	Full moon	2 7 A
	Full moon	10 8M		Last quart.	9 7 A
	Last quart.	17 4 A		New moon	18 1M
	New moon	24 10M		First quart.	25 2 A
	First quart.	31 9 A	December {	Full moon	2 6M
June {	Full moon	8 9 A		Last quart.	9 3 A
	Last quart.	15 10 A		New moon	17 6 A
	New moon	22 7 A		First quart.	24 11 A
	First quart.	30 3 A		Full moon	31 8 A

Five Eclipses this Year, three of the Sun, and two of the Moon.

The first is of the Moon, *June* the 8th, visible and total.

The Second is of the Sun, *June* the 22d, invisible.

The third of the Sun, *Nov.* the 18th, invisible.

The Fourth of the Moon, *Decemb.* the 2d, visible and total.

The Fifth of the Sun, *Decemb.* the 17th, invisible.

Months		D.	H.	Months		D.	H.
January	Last quart.	8	9 M	July	Last quart.	4	10 A
	New moon	16	9 M		New moon	11	5 A
	First quart.	23	8 M		First quart.	19	7 M
	Full moon	30	2 A		Full moon	27	4 M
February	Last quart.	7	9 M	August	Last quart.	3	5 M
	New moon	14	mid		New moon	10	3 M
	First quart.	21	4 A		First quart.	17	10 A
	Full moon	28	12 A		Full moon	25	4 A
March	Last quart.	9	2 M	September	Last quart.	1	noon
	New moon	16	10 M		New moon	8	3 A
	First quart.	24	3 A		First quart.	16	1 A
	Full moon	30	6 A		Full moon	24	2 M
April	Last quart.	7	4 A	October	Last quart.	30	10 A
	New moon	14	3 A		New moon	8	7 M
	First quart.	21	4 A		First quart.	16	7 M
	Full moon	29	11 M		Full moon	23	noon
May	Last quart.	7	4 M	November	Last quart.	30	8 M
	New moon	14	2 M		New moon	7	1 M
	First quart.	21	5 M		First quart.	14	9 A
	Full moon	29	2 M		Full moon	21	10 A
June	Last quart.	5	2 A	December	Last quart.	28	10 A
	New moon	12	8 M		New moon	6	7 A
	First quart.	19	3 A		First quart.	14	noon
	Full moon	27	4 A		Full moon	21	noon
					Last quart.	28	2 A

There will be four Eclipses this Year ; two of the Sun and two of the Moon.

The First will be of the Sun, *May* the 14th, invisible.

The Second will be of the Moon, *May* the 29th, visible 10 Digits.

The Third will be of the Sun, *November* the 7th, invisible.

The Fourth will be of the Moon, *November* the 21st, visible 8 Digits.

A Table of the Moon's Age for the Year 1752. 31

Months	D.	H.	Months	D.	H.
January	New moon 5	1 A	July	First quart. 7	10 M
	First quart. 13	mid.		Full moon 15	7 M
	Full moon 19	8 A		Last quart. 22	9 A
	Last quart. 27	8 M		New moon 29	3 A
February	New moon 4	7 M	August	First quart. 5	11 A
	First quart. 11	10 M		Full moon 13	11 A
	Full moon 18	8 M		Last quart. 21	5 M
	Last quart. 26	1 M		New moon 28	mid.
March	New moon 4	9 A	September	First quart. 4	3 A
	First quart. 11	6 A		Full moon 12	1 A
	Full moon 19	3 M		Last quart. 19	1 A
	Last quart. 26	6 A		New moon 26	noon
April	New moon 3	9 M	October	First quart. 4	9 M
	First quart. 10	4 M		Full moon 12	2 M
	Full moon 17	11 M		Last quart. 18	11 A
	Last quart. 25	9 M		New moon 26	2 M
May	New moon 2	6 A	November	First quart. 3	2 M
	First quart. 9	1 A		Full moon 10	1 A
	Full moon 17	3 M		Last quart. 17	9 M
	Last quart. 25	Mid.		New moon 24	7 A
June	New moon 1	1 M	December	First quart. 2	7 A
	First quart. 7	11 A		Full moon 10	1 M
	Full moon 15	5 A		Last quart. 16	9 A
	Last quart. 23	11 M		New moon 24	10 M
	New moon 30	8 M			

There will be two Eclipses this Year, both of the Sun.

The First will be on *May* the 2d, invifible.

The second will be on *October* the 26th, invifible.

The Use of the foregoing Table of the Moon's Age.

IN the said Table the one half Page contains the first six Months of the Year, the other half the following six Months; in the first Column of each half, towards the Left-hand, are the Months; in the second the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the said New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A signifying Afternoon, M Morning. At the Bottom of the Tables are the Eclipses for the respective Year.

The Use of the Table is, readily by Inspection, to find the Day, and Hour, of the New, Full, or Quarters of the Moon.

Example 1. Suppose it were desired to find the time of New-moon, *Jan.* 1746. First look for the Year 1746 on the Top of the Leaf, which having found, look for *January* in the first Column towards the Left-hand; then in the next Column in the same Month is found New moon; and in the two following Columns against New-moon stands 10.5 A, which shews that the New moon in *January* 1746 is the 10th Day at 5 Afternoon. The same Directions serve for the Full Moon, or First and Last Quarters.

To find the Moon's Age, subtract the Day of the Change or New-moon from the Day proposed, the Remainder is the Moon's Age. Suppose therefore it was required to find the Moon's Age for *March* 30, 1748.

Looking in the Year 1748, the Table gives the New-moon for *March* to be on the 18th Day, therefore 18 being subtracted from 30, there remains 12, whereby it appears the Moon is 12 Days old on the 30th of *March* in the Year 1748.

Example. Suppose it were required to find the Moon's Age on the 1st of *November*, 1746.

The last New-moon before *Nov.* 1st was *Octob.* 3d, but because you cannot take 3 from 1, you must add 31 (the Number of Days in *Octob.*) and from the Sum 32 subtract 3: the Remainder 29 is the Moon's Age required.

A Tide Table for the Sea-Coasts of Great-Britain, Ireland, Norway, Holland, Flanders, France, Biscay, &c. Shewing what Moon makes Full Sea, upon the Full and Change Days, at the Places following, in Alphabetical Order.

A		H. M.	At <i>Abermorich</i> , and <i>Antwerp</i> ,	H. M.
A	T <i>Army</i> , NNE. and SSW	01 30	East and West ———	06 00
	At <i>Amsterdam</i> and <i>Armentiers</i> ; NE. and SW. ———	03 00	At <i>Alborough</i> , SE by S. and NW. by N. ———	09 45
	At <i>Abarwark</i> , ENE. and W.S.W. ———	04 30	At	

The Tide-Table.

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B	H M	Between Guernsey and the	H. M
At <i>Beachy</i> and <i>Blacktail</i> , and before the <i>Race of Blan-</i> <i>quet</i> , N. and S	12 00	<i>Caskets</i> , before <i>Cromer</i> , before the <i>Caskets</i> and <i>Guernsey</i> , <i>Seven</i> <i>Clifts</i> , and at <i>Calnefs</i> , SE. and NW.	09 00
Thwart of <i>Beachy</i> in the <i>Of</i> <i>fin</i> N by E. and S by W	00 45	At the <i>Caskets</i> , and at <i>Cham-</i> <i>bernefs</i> , SE. by S and NW by N	09 45
At <i>Blacknefs</i> , in <i>Bluet</i> , at <i>Bell</i> <i>Isle</i> , NNE. and SSW.	01 30	At <i>Cows</i> , in the <i>Fofs of Caen</i> , in <i>Calice Road</i> , and in <i>Chamber-</i> <i>nefs Road</i> , SSE. and NNW.	10 30
Without <i>Bluet</i> , and at <i>Ber-</i> <i>wick</i> , NE by N and SW by S.	02 15	Before the Haven of <i>Caen</i> , in the <i>Chamber</i> , between <i>Crip-</i> <i>ple-sand</i> and the <i>Greyl</i> , and at <i>Calshot</i> , S by E. and N by W.	11 15
The River of <i>Bourdeaux</i> , the South Coast of <i>Bretagne</i> , the Coast of <i>Biscay</i> , and at <i>Bock-</i> <i>nefs</i> NE and SW	03 00	D	
At <i>Brest</i> before the <i>Base</i> , the Ri- ver of <i>Bourdeaux</i> within the Ha- ven, NE by E. and SW by W.	03 45	At <i>Dover Pier</i> , and before <i>Dunkirk</i> , N and S	12 00
In the <i>Breesound</i> , <i>Bloy</i> , <i>Bal-</i> <i>timore</i> , ENE. and WSW.	04 30	At <i>Denbeigh</i> and <i>Downs</i> in the Road, NE. by N. and SW by S	02 15
Before <i>Bremen</i> , and at <i>Black-</i> <i>ney</i> , and in the Channel before <i>Bourdeaux</i> , East and West	06 00	At <i>Dort</i> , NE. and SW	03 00
At <i>Bristol Key</i> , E by S. and W by N	06 45	At <i>Dungervan</i> , ENE. and WSW.	04 30
At <i>Bridgwater</i> , ESE. and W NW.	07 30	At <i>Dartmouth</i> East and West	06 00
<i>Bullen-deep</i> , SSE and NNW	10 30	At <i>Dublin</i> , SE by E. and NW by W.	08 15
C		At <i>Dunbar</i> , SE and NW	09 00
In <i>Condado</i> , N. and S	12 00	At <i>Dungenefs</i> and <i>Dunnose</i> , SE by S. and NW by N	09 45
In the <i>Chamber of Rye</i> , N. by E. and S. by W	00 45	At <i>Dover</i> , <i>Diep</i> , and in the <i>Downs</i> a shore, S. S. E. and N.	10 30
Without <i>Calice</i> , at <i>Corpus</i> <i>Christi</i> Point, before and at <i>Camfer</i> , NNE. and SSW.	01 30	E	
Between <i>Calice</i> and <i>Dover</i> , before <i>Conquet</i> , and at the N. Cape, NE. and SW.	03 00	At <i>Embsen</i> , before the <i>Elve</i> , before the <i>Eyder</i> , and before <i>Enchusen</i> , North and South	12 00
At <i>Cork</i> , <i>Calice</i> , <i>C. Clear</i> , and in the <i>Creek</i> , ENE. and WSW.	04 30	At <i>Edam</i> , NNE. and SSW.	01 30
At <i>Caldy</i> , and in the Bay of <i>Camarthan</i> , E by N. & W by S	05 15	Before the Eastern and West- ern <i>Emes</i> , and at <i>Engomonts</i> , SE and NW	09 00
At <i>Cencalo</i> , E and W.	06 00	F	
Without the <i>Caskets</i> , in the Channel SE by E. and NW by W.	08 15	On the Coast of <i>Flanders</i> , North and South	12 00
		At <i>Flushing</i> , N by E. and S by W.	00 45
		E	
		Before	

Before the <i>Fen</i> in the Chan- nel NNE and SSW	H. M 01 30	<i>Horn</i> , and at <i>Hampton-Key</i> , N. and S.	H. M 12 00
Without <i>Pountney</i> , NE by N and SW by S	02 15	Under <i>Holy Island</i> , and at <i>Horn</i> , NNE and SSW	01 30
Without the Banks of <i>Flan- ders</i> , NE and SW	03 00	Before <i>Hartlepool</i> , NE and S W	03 30
At <i>Flamborough</i> and <i>Bridling- ton</i> , ENE and WSW	04 30	At <i>Huntcliff-foot</i> , NE by E and SW by W	03 45
At the <i>Forn</i> , in <i>Foy</i> , at <i>Fal- mouth</i> , E by N and W by S	05 15	At <i>Humber</i> , E by N & W by S.	05 15
Between <i>Foy</i> and <i>Falmouth</i> , in the Channel, and at <i>Foul- ness</i> , E by S. and W by N.	06 45	Before <i>Hamborough</i> , at <i>Hull</i> , at the <i>Holms</i> , and before <i>Hum- ber's Mouth</i> , E and W.	06 00
Before the Coast of <i>Frize- land</i> , and the <i>Fly</i> , E S E and WNW	07 30	At <i>Harlem</i> , <i>Havre de Grace</i> , and <i>Homehead</i> , SE. and NW.	09 00
Without the <i>Fly</i> , SE by E and NW by W	08 15	At <i>St. Hellens</i> , at <i>Harwich</i> , and without the Banks of <i>Har- wich</i> , SSE and NNW	10 30
At <i>Frize</i> and <i>Fair Isle</i> , NW and S E	09 00	At <i>Harwich</i> within, S by E. and N by W.	11 15
At the <i>Frith</i> , and at the <i>South- Foreland</i> , SSE and NNW	10 30	I	
In <i>Fair Isle Roads</i> , and at the <i>North Foreland</i> , S by E and N by W	11 15	At <i>Jutland Islands</i> N and S	12 00
G		On the West Coast of <i>Ire- land</i> , NE and SW.	03 00
In the Road of <i>Gibraltar</i> , at <i>Graveling</i> , and before <i>Cher- burg</i> , N and S	12 00	In all the Havens of the South Coast of <i>Ireland</i> , E by N and W by S	05 15
Before <i>Goeree</i> , at <i>Guernsey</i> , & at <i>Gravesend</i> , NNE and SSW	01 30	K	
At <i>Groin</i> , at <i>Gastoign</i> , and the Coast of <i>Galicia</i> , NE and SW	03 00	<i>Kentish Knock</i> , N and S	12 00
Between <i>Guernsey</i> , and <i>Caf- kets</i> , SE. and NW	09 00	At <i>Kelliers</i> , NE and SW	03 00
Thwart of <i>Guernsey</i> in the Channel, SE by S and N W by N	09 45	At <i>Kingfale</i> , ENE & WSW	04 30
In the <i>Chamber</i> and <i>Goeree- end</i> , S by E and N by W	11 15	At <i>Kilduyn</i> , ESE and WN W	07 30
H		At <i>Kildive</i> , SE. and NW	09 00
Before the <i>Hever</i> , before		L	
		At <i>Leith</i> , N. and S	12 00
		At <i>Lisbon</i> , NE. by N. and SW by S	02 15
		At <i>London</i> , NE and SW	03 00
		Thwart of <i>Londey</i> , and be- fore <i>Lin</i> , E by N and W by S	05 15
		At <i>Lin</i> half Tide, at <i>Lon- dey</i> , E and W	06 00
		At <i>Lin</i> , E by S and W by N	06 45
		At	

The Tide-Table.

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	H	M		H	M
At the <i>Lizard</i> by the Land, ESE and WNW. ———	07	30	Between the <i>Naze</i> and <i>Ward</i> , head of <i>Lower</i> , S by E & N by W	11	15
At <i>Lambay</i> , SE by E. and NW by W ———	08	15	O		
At <i>Leystaff</i> , and thwart of it without the Banks, SE by S. and NW by N. ———	09	45	At <i>Orkness</i> , NE. and SW.	03	00
In <i>Leystaff</i> Road, & at <i>Longland-head</i> , SSE. and NNW.	10	30	At <i>Orkney</i> , SE. and NW.	09	00
M			At <i>Orfordness</i> , SE by S and NW by N. ———	09	45
Within the <i>Maes</i> , at <i>Maldon</i> N by E and S. by W ———	00	45	At <i>Orfordness</i> , without the Banks, and between <i>Orford</i> and <i>Orwell Waves</i> , SSE & NNW	10	30
Before the <i>Maes</i> , NNE. and SSW. ———	01	30	At <i>Orfordness</i> , within the Sands, S by E and N by W.	11	15
At the <i>Maes</i> , and before St. <i>Matthews</i> Point, NE by E. and SW by W. ———	03	45	P		
In <i>Mousehole</i> , at St. <i>Matthews</i> , and within <i>Mounts-bay</i> , ENE and WSW. ———	04	30	At <i>Portsmouth</i> Half-Tide, N and S ———	12	00
In <i>Milford</i> , at <i>Moonless</i> at St. <i>Malo</i> , E by N. and W. by S.	05	15	At the <i>Pens</i> , <i>Portbus</i> and <i>Poictu</i> , NE and SW ———	03	00
Between <i>Mousehole</i> and <i>Falmouth</i> and in <i>Milford Haven</i> , ESE. and WNW. ———	07	30	On the Coast of <i>Portugal</i> , NE by E and SW by W ———	03	45
In St. <i>Magnes</i> Sound, and at <i>Magnes</i> Castle, SE by E. and NW by W. ———	08	15	In <i>Plymouth</i> , and before St. <i>Paul's</i> , E by N. and W by S.	05	15
At the <i>Isle of Man</i> , SE. & NW.	09	00	At St. <i>Paul's</i> in the Haven, E and W. ———	06	00
Before <i>Margate</i> , S by E and N by W. ———	11	15	Before <i>Podeffemeck</i> , E by S. and W by N ———	06	45
N			Thwart of <i>Plymouth</i> , ESE. and WNW ———	07	30
At <i>Newport</i> Half-tide N & S	12	00	At the Race of <i>Portland</i> , SE and NW ———	09	00
At the West-end of the <i>Nore</i> , N by E. and S by W. ———	00	45	Q		
Before the River of <i>Nantz</i> , NE. and SW ———	03	00	At <i>Quinborough</i> , N and S	12	00
At <i>Newcastle</i> , E. by N & W by S	05	15	R		
Before St. <i>Nicholas</i> , E by S. and W by N. ———	06	45	At <i>Rocheſter</i> , N by E & S by W	00	45
At the <i>Needles</i> , at the <i>Isle of Wight</i> , SE by E and NW by W	08	15	At <i>Ramkins</i> , NNE. & SSW	01	30
All the Coast of <i>Normandy</i> , and <i>Picardy</i> , SSE. and NNW.	10	30	At <i>Rotterdam</i> in <i>Robin Hood's</i> Bay, and from the Race to the Pole-head, NE and SW ———	03	00
			At <i>Rouen</i> , and before <i>Rochel</i> NE by E and SW by W ———	03	45
			In <i>Ramsay</i> , E by N & W by S	05	15
			S		
			In the <i>Sleeve</i> between <i>Ushant</i> and <i>Scilly</i> , at the <i>Shoe</i> , at the E 2 Spits		

<i>Spits</i> , at <i>Southampton</i> , and along the <i>Swin</i> , N and S	H. M.	12 00	In the <i>Vour</i> , at the Bay, within <i>Ushant</i> , ENE and WSW	H. M.	04 30
Upon the Coast of <i>Spain</i> , and in <i>Shetland</i> , NE. and SW.	03 00		Without <i>Ushant</i> , E and W	06 00	
At <i>Scilly</i> , the Sound <i>Scarburgh</i> & at <i>Staples</i> NE by E & SW by W	03 45		St. <i>Vallery</i> , SSE and NNW.	10 30	
At <i>Seven Isles</i> , without the Haven, in the broad Sound, ENE. and WSW	04 30		W		
At the mouth of <i>Severn</i> between <i>Scilly</i> & the <i>Lizard</i> , at the <i>Spurn</i> & <i>Stockton</i> , E. by N. & W. by S.	05 15		At <i>Winchelsea</i> , N by E. and S by W	00 45	
Without <i>Scilly</i> , in the Channel, and at <i>Salcomb</i> , E. and W	06 30		At the <i>Weilings</i> , and from the West end of the <i>Wight</i> , NNE. and SSW.	01 30	
At <i>Sedmouth</i> and at the <i>Start</i> , E by S and W by N	06 45		Before the <i>Weilings</i> , NE by N. and SW by S	02 15	
Off the <i>Start</i> in the Channel, E S E and W N W	07 30		At <i>Whitby</i> , NE and SW	03 00	
Within the <i>Seyn</i> , and before <i>Shelberg</i> , at 7 <i>Clefts</i> , SE. & NW.	09 00		In the Sea of <i>Wales</i> and <i>Severn</i> , ENE. and WSW	04 30	
At <i>Shorham</i> , SE by S & NW by N	09 45		In <i>Wales</i> E. by N. & W. by S.	05 15	
At <i>Seyn-head</i> , SSE & NNW	10 30		At <i>Wells</i> , at <i>Weymouth</i> , and at <i>Waterford</i> , East and West	06 00	
T			At <i>Weymouth Key</i> , E by S. and W by N	06 45	
Within <i>Tervere</i> , N by E. and S by W.	00 45		At the <i>Nefs</i> , by <i>Wieringhen</i> , at <i>Winterton</i> , ESE. and WNW	07 30	
Before <i>Tervere</i> , before the River of <i>Thames</i> , and at <i>Tinmouth</i> , NNE and SSW	01 30		Thwart of the Isle of <i>Wight</i> , in the Channel, all within the Isle of <i>Wight</i> , between the Isle of <i>Wight</i> and <i>Beachy</i> , by the shore, SE by E. and NW by W.	08 15	
Before the <i>Tees</i> and <i>Tinmouth</i> , before the Bay of <i>Tinmouth</i> , NE and SW	03 00		At the East end of the <i>Wight</i> , and on <i>Wieringhen Flats</i> , S. E. and N W.	09 00	
At the <i>Clefts</i> of the <i>Texel</i> , ENE. and WSW	04 30		Y		
In <i>Torbay</i> and before the <i>Texel</i> , E and W	06 00		Before <i>Yarmouth</i> , NNE. and SSW	01 30	
In the Road of the <i>Texel</i> , ESE. and WNW	07 30		At <i>Youghall</i> , ENE and W. S W	04 30	
At <i>Torgen</i> , SE by S. and N. W by N.	09 45		At <i>Yarmouth</i> , SE by E. and NW by W	08 15	
U			In <i>Yarmouth-Road</i> , in <i>Yarmouth Haven</i> , SSE and NNW	10 30	
Before <i>Ureck</i> , N. and S	12 00		Z		
At <i>Ufe</i> , NE. and SW	03 00		On the Coast of <i>Zealand</i> , NNE. and SSW.	01 30	
Between <i>Ushant</i> and the Main, NE by E. and SW by W	03 45		In the <i>Zerick Sea</i> , NE & SW	03 00	
			THE		

THE foregoing Table shews the Time of Full Sea at the several Places therein contained, upon the Full and Change Days of the Moon, which for more ready Use is put in Alphabetical Order.

Example. Admit the Time of Full Sea at *London*, upon the Full and Change Days required.

Look into the Table under the Letter (L) it is found to flow at *London* North East and South West; that is when it is Full Sea at *London*, the Moon will be, as 'tis vulgarly said, upon the North East and South West Points of the Compass, which, as the Compass shews, is 3 Hours.

The Use of this, together with the Moon's Southing, to find the time of Full Sea at any Time, at any of the said Places shall be shewn below.

To find the Moon's Southing.

To find the Southing of the Moon, multiply the Moon's Age by 4 and divide the Product by 5, and the Quotient is the Time of Southing in Hours, and the Remainder is so many 12 min. of an Hour.

Note. If the Moon's Age exceed 15, reject the said 15, and take the Remainder, with which proceed instead of the Moon's Age, and it gives her Southing in the Morning.

Example. Suppose the Time of the Moon's Southing be required on the 25th of *November* 1746. The Moon's Age was found to be 23 Days, rejecting 15, the Remainder is 8, which multiplied by 4 makes 32, which divided by 5, gives the Quotient 6 Hours 24 Minutes, which is the Time of the Moon's Southing, which was required.

I shall here add a Table of the Moon's Southing to every Day of her Age.

Moon's Age.	Time
H	M
1 — 16	0 — 48
2 — 17	1 — 36
3 — 18	2 — 24
4 — 19	3 — 12
5 — 20	4 — 00
6 — 21	4 — 48
7 — 22	5 — 36
8 — 23	6 — 24
9 — 24	7 — 12
10 — 25	8 — 00
11 — 26	8 — 48
12 — 27	9 — 36
13 — 28	10 — 24
14 — 29	11 — 12
15 — 30	12 — 00

The Use of the TABLE.

The first and second Column shews the Moon's Age, the third the Southing.

Example.

The Moon being 9 Days old, and her Southing required.

In the first Column under the Title Moon's Age stands 9; over against it in the last Column is 7 Hours 12 Minutes, the Time of the Southing required.

Note also, the same Southing serves for 24 Days old, as serves for 9 Days, as the Table shews.

Thus

The Use of the Tide-Table.

Thus having got the Moon's] Southing, proceed to find the Time of Full Sea, as follows.

Suppose the Moon being 9 Days old, the Time of Full Sea in the Downs is required.

By the foregoing Table it appears that a N. N. W. and S. S. E. Moon makes full Sea, which as the said Table shews, is 10 Hours 30 Minutes; to which adding the Moon's Southing at 9 Days old, (*viz.* 7 Hours 12 Minutes,) it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes, rejecting 12 Hours in the Morning.

But to be more exact use the following Table and Directions.

Moon's Age.	Time	
	H	M
1 ——— 16	0 ———	43
2 ——— 17	1 ———	20
3 ——— 18	1 ———	52
4 ——— 19	2 ———	22
5 ——— 20	2 ———	52
6 ——— 21	3 ———	26
7 ——— 22	4 ———	07
8 ——— 23	4 ———	55
9 ——— 24	5 ———	50
10 ——— 25	6 ———	53
11 ——— 26	7 ———	59
12 ——— 27	9 ———	04
13 ——— 28	10 ———	08
14 ——— 29	11 ———	05
15 ——— 30	00 ———	00

Having found the Time of Full Sea, upon the Full and Change Days, by the preceding Table for that Purpose, enter this Table with the Moon's Age; against which in the last Column are the Hours and Minutes to be added for the time of Full Sea desired.

Example.

Suppose as before, the Moon being 9 Days old, and the Time of Full Sea in the Downs is required.

A NNW. and SSE. Moon makes Full Sea upon the Full and Change Days, which is 10 hours 30 min. which being found, enter the Table with the Moon's Age 9 Days, against which stands 5 hours 50 min. which added to 10 hours 30 min. makes 16 hours 20 min. or 4 hours 20 min. (rejecting 12 hours) in the Morning.

Here follows

A New and Exact KALENDAR O F

The Golden Number, Epact and Moveable Feasts, as also of the Sun's Place and Declination to every Day of the Year, for the First, Second, Third, and Leap-Year newly calculated and made to serve (without any sensible Error) till the Year 1761. Likewise the Sun's Rising, whereby may be found the Time of the Setting and Length of the Day and Night; together with the Southing of the Principal Fixed Stars at Midnight.

A Table of the Dominical Letters, Cycle of the Sun, Prime, Epact, and Moveable Feasts, for 24 Years to come.

Years.	Dom. Letter	Cycle of ☉	Prime	Epact.	Shrove-Sunday.	Easter-Sunday.	Whit-Sunday.
1738	A	11	10	20	February 12	April 2	May 21
1739	G	12	11	1	March 4	22	June 10
1740	FE	13	12	12	February 17	6	May 25
1741	D	14	13	23	8	March 29	17
1742	C	15	14	4	28	April 18	June 6
1743	B	16	15	15	February 13	April 3	May 22
1744	AG	17	16	26	5	March 25	13
1745	F	18	17	7	24	April 14	June 2
1746	E	19	18	18	9	March 30	May 18
1747	D	20	19	29	March 1	April 19	June 7
1748	CB	21	1	11	February 21	April 10	May 29
1749	A	22	2	22	5	March 26	14
1750	G	23	3	3	25	April 15	June 3
1751	F	24	4	14	17	7	May 26
1752	ED	25	5	25	9	March 29	17
1753	C	26	6	6	February 21	April 11	May 30
1754	B	27	7	17	13	3	May 22
1755	A	28	8	28	March 5	23	June 11
1756	GF	01	9	9	February 25	14	June 2
1757	E	02	10	20	9	March 30	May 18
1758	D	03	11	1	March 1	April 19	June 7
1759	C	04	12	12	February 21	11	May 30
1760	BA	05	13	23	6	March 26	14
1761	G	06	14	4	February 25	April 15	June 3

Jan.

Month	Week Days	Remarkable days, and four-thing of Stars at Midnight.	First Year		Second Year		Third Year		Leap Year	
			1741 1749	1745 1753	1742 1750	1746 1754	1743 1751	1747 1755	1744 1752	1748 1756
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			☿	South	♊	South	☿	South	♊	South
1	A	Circumcision	22 22	21 37	22 07	21 40	21 52	21 42	21 38	21 44
2	B	Sun r. 8. 0.	23 23	21 27	23 08	21 30	22 53	21 32	22 39	21 35
3	C		24 24	21 17	24 09	21 19	23 55	21 22	23 40	21 24
4	D		25 25	21 06	25 10	21 08	24 56	21 11	24 41	21 14
5	E		26 26	20 54	26 12	20 57	25 57	21 00	25 42	21 03
6	F	Epiphany	27 28	20 42	27 13	20 45	26 58	20 48	26 43	20 51
7	G		28 29	20 30	28 14	20 33	27 59	20 30	27 44	20 39
8	H		29 30	20 18	29 15	20 21	29 00	20 24	28 45	20 27
9	I	Sol in Aq.	☿ 31	20 05	☿ 16	20 08	☿ 01	20 11	29 46	20 14
10	A		01 32	19 51	01 17	19 55	01 02	19 58	☿ 47	20 01
11	B		02 33	19 38	02 18	19 41	02 03	19 44	01 48	19 48
12	C		03 34	19 24	03 19	19 27	03 04	19 30	02 49	19 34
13	D	Sun r. 7. 44	04 35	19 09	04 20	19 13	04 05	19 16	03 50	19 20
14	E		05 36	18 54	05 21	18 58	05 06	19 07	04 51	19 05
15	F		06 37	18 39	06 22	18 43	06 07	18 47	05 52	18 50
16	G		07 38	18 24	07 23	18 28	07 08	18 31	06 53	18 35
17	H		08 38	18 08	08 24	18 12	08 09	18 16	07 54	18 20
18	I		09 39	17 51	09 25	17 56	09 10	18 00	08 55	18 04
19	A		10 40	17 36	10 25	17 40	10 11	17 44	09 56	17 48
20	B		11 41	17 19	11 26	17 23	11 12	17 27	10 57	17 31
21	C	Sun r. 7. 30.	12 42	17 02	12 27	17 06	12 12	17 10	11 58	17 14
22	D		13 43	16 44	13 28	16 49	13 13	16 53	12 58	16 57
23	E		14 43	16 27	14 29	16 31	14 14	16 35	13 59	16 40
24	F		15 44	16 09	15 30	16 13	15 15	16 18	15 00	16 22
25	G	Conv. St. Paul	16 45	15 51	16 30	15 55	16 16	16 00	16 01	16 04
26	H		17 46	15 32	17 31	15 36	17 16	15 41	17 02	15 46
27	I		18 46	15 14	18 31	15 18	18 17	15 23	18 02	15 27
28	A		19 47	14 55	19 32	14 59	19 18	15 04	19 03	15 08
29	B		20 48	14 35	20 33	14 40	20 18	14 45	20 04	14 45
30	C	K. Charles M	21 48	14 16	21 34	14 21	21 19	14 25	21 04	14 30
31	D		22 49	13 56	22 34	14 01	22 20	14 06	22 05	14 11

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Month	Week Days	Remarkable days, and fouthing of Stars at Midnight.	First		Year		Second		Year		Third		Year		Leap		Year			
			1741	1749	1745	1753	1742	1750	1746	1754	1743	1751	1747	1755	1744	1752	1748	1756		
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec		
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M		
			☿ South		☿ South		☿ South		☿ South		☿ South		☿ South		☿ South		☿ South			
1	A	Purif. Mary	23	50	13	36	23	35	13	41	23	20	13	46	23	05	13	51		
2	B	Lyon's Heart	24	50	13	16	24	35	13	21	24	21	13	26	24	06	13	31		
3	C		25	51	12	56	25	36	13	01	25	21	13	06	25	07	13	11		
4	D		26	51	12	35	26	37	12	40	26	22	12	45	26	07	12	50		
5	E	Lyon's Neck.	27	52	12	14	27	37	12	19	27	22	12	24	27	08	12	29		
6	F	Sun r. 7. 1.	28	52	11	53	28	37	11	58	28	23	12	03	28	08	12	09		
7	G	Sol in Pisces.	29	53	11	32	29	38	11	37	29	23	11	42	29	09	11	48		
8	H		☿	53	11	11	☿	38	11	16	☿	24	11	21	☿	09	11	26		
9	I		01	53	10	49	01	39	10	55	01	24	11	06	01	09	11	05		
10	K		02	54	10	28	02	39	10	33	02	24	10	38	02	10	10	43		
11	L		03	54	10	06	03	39	10	11	03	25	10	16	03	10	10	22		
12	M		04	54	09	44	04	40	09	49	04	25	09	54	04	10	10	00		
13	N	Sun r. 6. 45.	05	55	09	22	05	40	09	27	05	25	09	32	05	11	09	38		
14	O	Valentine	06	55	08	59	06	40	09	05	06	26	09	10	06	11	09	16		
15	P	Lower of the	07	55	08	37	07	40	08	42	07	26	08	48	07	11	08	53		
16	Q	two foremost	08	55	08	14	08	40	08	20	08	26	08	25	08	11	08	31		
17	R	in ☐ of great																		
18	S	Bear.	09	55	07	52	09	41	07	57	09	26	08	03	09	11	08	08		
19	T		10	55	07	29	10	41	07	35	10	26	07	40	10	12	07	46		
20	U		11	55	07	06	11	41	07	12	11	26	07	17	11	12	07	23		
21	V		12	55	06	43	12	41	06	49	12	26	06	54	12	12	07	00		
22	W	Sun r. 6. 29.	13	55	06	20	13	41	06	26	13	26	06	31	13	12	06	37		
23	X		14	55	05	57	14	41	06	03	14	26	06	08	14	12	06	14		
24	Y	St. Matthias	15	55	05	34	15	41	05	39	15	26	05	45	15	12	05	51		
25	Z		16	55	05	10	16	41	05	16	16	26	05	22	16	12	05	28		
26	A		17	55	04	47	17	41	04	53	17	26	04	58	17	12	05	04		
27	B		18	55	04	24	18	40	04	29	18	26	04	35	18	11	04	41		
28	C		19	55	04	00	19	40	04	06	19	26	04	12	19	11	04	17		
29	D		20	55	03	37	20	40	03	42	20	26	03	48	20	11	03	54		
			When it is Leap-Year February hath 29 Days														21	11	03	30

Month	Week Days	Remarkable days, and southing of Stars at Midnight.	First Year		Second Year		Third Year		Leap Year		Year							
			1741	1745	1742	1746	1743	1747	1744	1748								
			1749	1753	1750	1754	1751	1755	1752	1756								
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec						
			D M	D M	D M	D M	D M	D M	D M	D M	D M	D M						
			☿	South	☿	South	☿	South	☿	South	☿	South						
1	David		21	54	03	13	21	40	03	19	21	25	03	24	22	11	03	07
2	Lion's Tail		22	54	02	49	22	40	02	55	22	25	03	01	23	10	02	43
3	Lower of two		23	54	02	26	23	39	02	31	23	25	02	37	24	10	02	19
4	latter in ☐ of Great Bear.		24	53	02	02	24	39	02	08	24	24	02	14	25	10	01	56
5			25	53	01	38	25	39	01	44	25	24	01	50	26	09	01	32
6			26	53	01	15	26	38	01	20	26	24	01	26	27	09	01	08
7			27	52	00	51	27	38	00	57	27	23	01	02	28	08	00	45
8			28	52	00	27	28	37	00	33	28	23	00	39	29	08	00	24
9	Sun r. 6. o.		29	51	00	04	29	37	00	06	39	22	00	15	Y	07	Nor.	03
10			Y	50	Nor.	20	Y	36	Nor.	14	Y	22	Nor.	09	01	07	00	27
11	Upper of two		01	50	00	44	01	36	00	38	01	21	00	32	02	06	00	50
12	latter in ☐ of Great Bear.		02	49	01	07	02	35	01	02	02	20	00	56	03	05	01	14
13			03	49	01	31	03	34	01	25	03	20	01	20	04	05	01	37
14			04	48	01	55	04	33	01	49	04	19	01	43	05	04	02	01
15			05	47	02	18	05	32	02	12	05	18	02	07	06	03	02	25
16			06	46	02	42	06	32	02	36	06	18	02	30	07	03	02	48
17	Sun r. 5. 14.		07	46	03	05	07	31	02	59	07	17	02	54	08	02	03	11
18			08	45	03	28	08	30	03	23	08	16	03	17	09	02	03	35
19			09	44	03	52	09	30	03	46	09	15	03	40	10	00	03	58
20			10	43	04	15	10	29	04	09	10	14	04	04	10	59	04	21
21	Last but two		11	42	04	38	11	28	04	33	11	13	04	27	11	58	04	44
22	in Great		12	41	05	01	12	27	04	56	12	12	04	50	12	57	05	07
23	Bear's Tail		13	40	05	24	13	26	05	19	13	11	05	13	13	56	05	30
24	Sun r. 5. 30.		14	39	05	47	14	25	05	42	14	10	05	36	14	55	05	53
25	Lady. Day		15	38	06	10	15	24	06	04	15	09	05	59	15	54	06	16
26			16	37	06	33	16	23	06	27	16	08	06	22	16	53	06	39
27			17	36	06	55	17	21	06	50	17	07	06	44	17	52	07	01
28	Virgins Spike		18	34	07	18	18	20	07	12	18	06	07	07	18	51	07	24
29	Last but one		19	33	07	40	19	19	07	34	19	04	07	30	19	49	07	46
30	in Great		20	32	08	02	20	18	07	57	20	04	07	51	20	48	08	08
31	Bear's Tail		21	31	08	24	21	17	08	19	21	02	08	13	21	47	08	30

April hath XXX Days.

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Month	Days	Week Days	Remarkable days, and fourthing of Stars at Midnight.	First Year		Second Year		Third Year		Leap Year		Year	
				1741	1745	1742	1746	1743	1747	1744	1748	1748	1756
				1749	1753	1750	1754	1751	1755	1752			
				☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec		
				D M	D M	D M	D M	D M	D M	D M	D M	D M	D M
				γ	North	γ	North	γ	North	γ	North	γ	North
1	S	S	Sun. r. 5. 16.	22 29	08 46	22 15	08 41	22 01	08 35	22 45	08 52		
2	M	M		23 28	09 08	23 14	09 03	23 00	08 57	23 44	09 14		
3	T	T		24 27	09 29	24 12	09 24	23 58	09 19	24 42	09 35		
4	W	W	Last in Great Bear's Tail.	25 25	09 51	25 11	09 46	24 57	09 41	25 41	09 57		
5	T	T		26 24	10 12	26 10	10 07	25 55	10 02	26 40	10 18		
6	F	F	Sun. r. 5. 6.	27 22	10 33	27 08	10 28	26 54	10 23	27 38	10 39		
7	S	S		28 21	10 54	28 07	10 49	27 53	10 44	28 37	11 00		
8	S	S		29 19	11 15	29 05	11 10	28 51	11 05	29 35	11 21		
9	M	M		0 18	11 36	0 04	11 31	29 49	11 26	0 34	11 41		
10	T	T		01 16	11 56	01 02	11 51	0 48	11 46	01 32	12 02		
11	W	W	Dragon's Tail	02 15	12 16	02 00	12 12	01 46	12 07	02 30	12 22		
12	T	T	Arcturus.	03 13	12 36	02 59	12 32	02 45	12 27	03 29	12 42		
13	F	F		04 11	12 56	03 57	12 52	03 43	12 47	04 21	13 02		
14	S	S		05 09	13 16	04 55	13 12	04 41	13 06	05 25	13 21		
15	S	S		06 08	13 35	05 54	13 31	05 39	13 26	06 24	13 41		
16	M	M	Sun. r. 4. 48.	07 06	13 54	06 52	13 50	06 37	13 45	07 22	14 00		
17	T	T		08 04	14 13	07 50	14 09	07 36	14 02	08 20	14 19		
18	W	W		09 02	14 32	08 48	14 28	08 34	14 23	09 18	14 37		
19	T	T		10 00	14 51	09 46	14 46	09 32	14 42	10 16	14 56		
20	F	F	Southernmost Scale in Libra	10 58	15 09	10 44	15 04	10 30	15 00	11 14	15 14		
21	S	S		11 57	15 27	11 42	15 22	11 28	15 18	12 11	15 32		
22	M	M	Sun. r. 4. 37.	12 55	15 45	12 41	15 40	12 26	15 36	13 10	15 49		
23	T	T	St. George	13 53	16 02	13 39	15 58	13 24	15 54	14 08	16 07		
24	W	W		14 51	16 19	14 37	16 15	14 22	16 11	15 06	16 24		
25	T	T	St Mark Ev.	15 49	16 36	15 35	16 32	15 20	16 28	16 04	16 41		
26	W	W	Upper of two	16 46	16 53	16 32	16 49	16 18	16 45	17 02	16 57		
27	T	T	foremost in	17 44	17 09	17 30	17 06	17 16	17 01	18 00	17 14		
28	F	F	of Little Bear	18 42	17 25	18 28	17 21	18 14	17 17	18 58	17 30		
29	S	S		19 40	17 41	19 26	17 37	19 12	17 33	19 56	17 45		
30	M	M	N Scale of ♋	20 38	17 57	20 25	17 53	20 10	17 49	20 54	18 01		

Month	Week Days	Remarkable days, and something of Stars at Midnight	First Year		Second Year		Third Year		Leap Year		Year	
			1741 1749	1745 1753	1742 1750	1746 1754	1743 1751	1747 1755	1744 1752	1748 1756		
Days			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ plac	☉ dec		
			D M	D M	D M	D M	D M	D M	D M	D M	D M	D M
			♈	North	♈	North	♈	North	♈	North		
1	B	Phil. and Jae.	21 36	18 12	21 22	18 08	21 08	18 04	21 52	18 16		
2	C	Sun r. 4. 21	22 34	18 27	22 20	18 23	22 06	18 19	22 49	18 31		
3	D	Brightest in	23 31	18 41	23 17	18 38	23 03	18 34	23 47	18 45		
4	E	the Crown.	24 29	18 56	24 15	18 52	24 01	18 49	24 45	18 59		
5	F	Brightest in	25 27	19 10	25 13	19 06	24 59	19 03	25 43	19 15		
6	G	Serpents neck	26 24	19 23	26 10	19 20	25 57	19 17	26 40	19 27		
7	A		27 22	19 37	27 08	19 33	26 55	19 30	27 38	19 40		
8	B		28 20	19 50	28 06	19 46	27 52	19 43	28 36	19 53		
9	C	Scorpions	29 17	20 02	29 03	19 59	28 50	19 56	29 33	20 06		
10	D	Forehead.	II 15	20 14	II 01	20 11	29 47	20 09	II 31	20 18		
11	E	Sun r. 4. 8.	01 13	20 26	00 59	20 23	II 44	20 21	01 28	20 30		
12	F		02 10	20 38	01 56	20 35	01 42	20 32	02 26	20 41		
13	G		03 08	20 49	02 54	20 47	02 40	20 44	03 23	20 52		
14	A	Scorpions	04 05	21 00	03 51	20 58	03 37	20 55	04 21	21 03		
15	B	Heart.	05 02	21 11	04 49	21 08	04 35	21 06	05 18	21 14		
16	C		06 00	21 21	05 46	21 18	05 32	21 16	06 16	21 24		
17	D		06 59	21 31	06 44	21 28	06 30	21 26	07 13	21 33		
18	E		07 56	21 40	07 42	21 38	07 27	21 36	08 11	21 43		
19	F		08 53	21 49	08 39	21 47	08 25	21 45	09 09	21 52		
20	G	Sun r. 3. 57.	09 50	21 58	09 36	21 56	09 22	21 54	10 06	22 00		
21	A		10 47	22 06	10 33	22 04	10 20	22 02	11 03	22 08		
22	B		11 45	22 14	11 31	22 13	11 17	22 10	12 01	22 16		
23	C		12 42	22 22	12 29	22 20	12 14	22 18	12 58	22 24		
24	D		13 40	22 29	13 26	22 27	13 12	22 25	13 56	22 31		
25	E		14 37	22 36	14 23	22 34	14 09	22 32	14 54	22 37		
26	F		15 34	22 42	15 20	22 41	15 07	22 39	15 50	22 44		
27	G	Sun r. 3. 53.	16 32	22 48	16 18	22 47	16 04	22 45	16 47	22 50		
28	A		17 29	22 54	17 16	22 52	17 01	22 51	17 45	22 55		
29	B	K.C.II. B.&R	18 26	22 59	18 13	22 58	17 58	22 57	18 42	23 00		
30	C		19 23	23 04	19 10	23 02	18 56	23 02	19 39	23 05		
31	D		20 20	23 08	20 07	23 07	19 53	23 06	20 36	23 09		

June hath XXX Days.

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Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	First	Year	Second	Year	Third	Year	Leap	Year
			1741	1745	1742	1746	1743	1747	1744	1748
			1749	1753	1750	1754	1751	1755	1752	1756
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			II	North	II	North	II	North	II	North
1	S	Sun r. 3. 50.	21 18	23 12	21 04	23 11	20 50	23 10	21 34	23 13
2	M		22 15	23 15	22 01	23 14	21 48	23 14	22 31	23 16
3	T		23 12	23 19	22 59	23 18	22 45	23 17	23 28	23 19
4	W		24 10	23 22	23 56	23 21	23 42	23 20	24 25	23 22
5	T		25 07	23 24	24 53	23 23	24 39	23 23	25 23	23 24
6	W		26 04	23 25	25 50	23 25	25 37	23 25	26 20	23 26
7	T		27 01	23 27	26 48	23 27	26 34	23 27	27 17	23 27
8	W		27 59	23 28	27 45	23 28	27 31	23 28	28 14	23 28
9	T	Sun r. 3. 47.	28 56	23 29	28 42	23 29	28 28	23 28	29 12	23 29
10	W		29 53	23 29	29 39	23 29	29 25	23 29	30 09	23 29
11	T		30 5	23 29	30 36	23 29	30 23	23 29	01 06	23 29
12	W		01 47	23 28	01 34	23 28	01 20	23 29	02 03	23 28
13	T		02 43	23 27	02 31	23 28	02 17	23 28	03 00	23 27
14	W		03 42	23 26	03 28	23 26	03 14	23 27	03 58	23 25
15	T		04 39	23 24	04 25	23 25	04 11	23 25	04 55	23 23
16	W		05 36	23 22	05 22	23 23	05 09	23 23	05 52	23 21
17	T	Brightest in the Harp.	06 33	23 19	06 20	23 20	06 06	23 21	06 49	23 18
18	W		07 31	23 16	07 17	23 17	07 03	23 18	07 46	23 15
19	T		08 28	23 13	08 14	23 14	08 00	23 14	08 44	23 12
20	W		09 25	23 09	09 11	23 10	08 57	23 11	09 41	23 08
21	T	Sun r. 3. 50.	10 22	23 05	10 08	23 06	09 54	23 07	10 38	23 03
22	W		11 19	23 00	11 05	23 01	10 52	23 02	11 35	22 59
23	T		12 16	22 55	12 03	22 56	11 49	22 57	12 32	22 53
24	W		13 14	22 49	13 00	22 5	12 46	22 52	13 29	22 43
25	T	John Baptist	14 11	22 44	13 58	22 45	13 43	22 47	14 27	22 42
26	W		15 08	22 37	14 55	22 39	14 40	22 40	15 24	22 36
27	T		16 05	22 31	15 52	22 32	15 37	22 34	16 21	22 29
28	W		17 02	22 24	16 49	22 25	16 35	22 27	17 18	22 22
29	T	Peter Apostle	18 00	22 16	17 46	22 18	17 32	22 20	18 15	22 14
30	W		18 57	22 08	18 43	22 10	18 29	22 12	19 13	22 06

Month	Week Days	Remarkable days, and fouthing of Stars at Midnight	First Year		Second Year		Third Year		Leap Year		Year							
			1741	1745	1742	1746	1743	1747	1744	1748								
			1749	1753	1750	1754	1751	1755	1752	1756								
Days			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec					
			D	M	D	M	D	M	D	M	D	M	D	M				
			☿	North	☿	North	☿	North	☿	North	☿	North	☿	North				
1	S	Sun r. 3. 57.	19	54	22	00	19	40	22	02	19	26	22	04	20	10	21	58
2	A		20	51	21	52	20	37	21	54	20	24	21	56	21	07	21	49
3	B		21	48	21	43	21	35	21	45	21	22	21	47	22	04	21	40
4	C		22	46	21	33	22	32	21	36	22	18	21	38	23	02	21	31
5	D		23	43	21	24	23	29	21	26	23	15	21	29	23	59	21	21
6	E	Brightest between the	24	40	21	14	24	26	21	16	24	13	21	19	24	56	21	11
7	F	Eagles should	25	37	21	03	25	24	21	06	25	10	21	08	25	53	21	01
8	G		26	35	20	53	26	21	20	55	26	07	20	58	26	50	20	50
9	H		27	32	20	42	27	18	20	44	27	04	20	47	27	48	20	38
10	I		28	29	20	30	28	15	20	33	28	02	20	36	28	45	20	26
11	J	Sun r. 4. 8.	29	27	20	18	29	13	20	21	28	59	20	24	29	42	20	13
12	K		☿	24	20	06	☿	10	20	09	29	56	20	21	☿	40	20	02
13	L		01	21	19	54	01	07	19	57	☿	54	20	00	01	37	19	50
14	M		02	19	19	41	02	05	19	44	01	51	19	47	02	54	19	37
15	N		03	16	19	28	03	02	19	31	02	48	19	34	03	32	19	24
16	O	Sun r. 4. 16.	04	13	19	14	03	59	19	18	03	46	19	21	04	29	19	10
17	P		05	11	19	00	04	57	19	04	04	43	19	07	05	27	18	56
18	Q	Swan's Tail	06	08	18	46	05	54	18	50	05	40	18	53	06	24	18	42
19	R	Dog days beg	07	06	18	32	06	52	18	35	06	38	18	39	07	21	18	28
20	S		08	03	18	17	07	49	18	21	07	35	18	24	08	19	18	13
21	T	Sun r. 4. 23.	09	00	18	02	08	47	18	06	08	33	18	10	09	16	17	58
22	U		09	58	17	47	09	44	17	51	09	30	17	54	10	14	17	43
23	V		10	55	17	31	10	42	17	35	10	28	17	39	11	12	17	27
24	W		11	53	12	15	11	39	17	19	11	25	17	23	12	09	17	11
25	X	James Apottle	12	50	16	59	12	37	17	03	12	23	17	07	13	06	16	55
26	Y	Sun r. 4. 30.	13	48	16	43	13	34	16	47	13	20	16	51	14	04	16	38
27	Z		14	46	16	26	14	32	16	30	14	18	16	34	15	01	16	22
28	A		15	43	16	09	15	29	16	13	15	15	16	17	15	59	16	05
29	B		16	41	15	52	16	27	15	56	16	13	16	00	16	56	15	47
30	C		17	38	15	35	17	24	15	39	17	10	15	43	17	54	15	30
31	D		18	36	15	17	18	22	15	21	18	08	15	25	18	52	15	12

August hath XXXI Days.

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Month	Week Days	Remarkable days, and something of Stars at Midnight	First	Year	Second	Year	Third	Year	Leap	Year
			1741	1745	1742	1746	1743	1747	1744	1748
			1749	1753	1750	1754	1751	1755	1752	1756
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ plac	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			☉ North	☉ North	☉ North	☉ North	☉ North	☉ North	☉ North	☉ North
1	Lammas		19 33	14 59	19 20	15 03	19 05	15 07	19 49	14 54
2			20 31	14 41	20 17	14 45	20 03	14 49	20 47	14 36
3			21 29	14 22	21 15	14 27	21 01	14 31	21 45	14 17
4			22 27	14 03	22 13	14 08	21 59	14 12	22 43	13 58
5			23 25	13 44	23 11	13 49	22 57	13 54	23 40	13 39
6			24 22	13 25	24 08	13 30	23 55	13 35	24 38	13 20
7	Sun r. 4. 50.		25 20	13 06	25 06	13 11	24 52	13 15	25 36	13 01
8			26 18	12 46	26 04	12 51	25 50	12 56	26 34	12 41
9			27 16	12 27	27 02	12 31	26 48	12 36	27 32	12 21
10			28 14	12 07	28 00	12 12	27 46	12 16	28 29	12 01
11			29 12	11 47	28 58	11 51	28 43	11 56	29 27	11 41
12	Sol in Virgo		☿ 09	11 26	29 55	11 31	29 41	11 36	☿ 25	11 21
13			01 07	11 06	☿ 53	11 11	☿ 39	11 16	01 23	11 09
14			02 05	10 45	01 51	10 50	01 37	10 55	02 21	10 39
15			03 03	10 24	02 49	10 29	02 35	10 34	03 19	10 18
16	Sun r. 5. 8.		04 01	10 03	03 47	10 08	03 33	10 13	04 17	09 57
17			04 59	09 42	04 45	09 47	04 31	09 52	05 15	09 36
18			05 58	09 21	05 44	09 26	05 29	09 31	06 13	09 15
19			06 56	08 59	06 42	09 04	06 28	09 09	07 12	08 53
20			07 54	08 37	07 40	08 43	07 26	08 48	08 10	08 31
21	Fomelhaut		08 52	08 16	08 38	08 21	08 24	08 26	09 08	08 10
22	Sun r. 5. 19.		09 50	07 54	09 36	07 59	09 22	08 04	10 06	07 48
23			10 48	07 32	10 34	07 37	10 20	07 42	11 04	07 26
24	Barthol Apo.		11 47	07 09	11 32	07 15	11 18	07 20	12 03	07 03
25	First in Pega-		12 45	06 47	12 30	06 53	12 17	06 58	13 02	06 41
26	gus's Wing.		13 43	06 25	13 29	06 30	13 15	06 36	13 59	06 19
27	Sun r. 5. 29.		14 42	06 02	14 28	06 08	14 13	06 14	14 58	05 56
28	Dog days end		15 40	05 40	15 26	05 45	15 12	05 51	15 56	05 33
29	Dec. J. R.		16 38	05 17	16 24	05 22	16 10	05 28	16 54	05 10
30			17 37	04 54	17 23	05 00	17 09	05 05	17 53	04 48
31			18 36	04 31	18 21	04 37	18 07	04 42	18 51	04 25

Month Days	Week Days	Remarkable days, and sou-thing of Stars at Midnight.	First	Year	Second	Year	Third	Year	Leap	Year
			1741	1745	1742	1746	1743	1747	1744	1748
			1749	1753	1750	1754	1751	1755	1752	1756
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			North	North	North	North	North	North	North	North
1	F	Sun r. 5. 38.	19 34	04 08	19 20	04 14	19 06	04 19	19 50	04 02
2	S	Lond burnt 66	20 32	03 45	20 18	03 51	20 04	03 56	20 48	03 39
3	M		21 31	03 22	21 17	03 28	21 03	03 32	21 47	03 16
4	T		22 30	02 59	22 15	03 05	22 02	03 09	22 46	02 53
5	F		23 28	02 36	23 14	02 41	23 00	02 47	23 45	02 29
6	S		24 27	02 13	24 13	02 18	23 59	02 24	24 43	02 06
7	M		25 26	01 49	25 11	01 55	24 57	02 01	25 42	01 43
8	T		26 24	01 26	26 10	01 52	25 56	01 37	26 40	01 19
9	F		27 23	01 02	27 09	01 08	26 55	01 14	27 39	00 56
10	S		28 22	00 39	28 08	00 41	27 53	00 50	28 38	00 32
11	M	Androm. Head	29 21	00 16	29 07	00 21	28 52	00 27	29 37	00 09
12	T	Sun r. 6. 0.	30 20	Sou. 08	30 05	Sou. 02	29 51	00 04	30 35	Sou. 14
13	F		01 19	00 31	01 04	00 26	30 50	Sou. 20	01 35	00 38
14	S		02 18	00 55	02 03	00 49	01 49	00 43	02 34	01 01
15	M	End of Pega- sus Wing.	03 17	01 18	03 02	01 13	02 48	01 07	03 33	01 25
16	T		04 16	01 42	04 01	01 36	03 47	01 31	04 32	01 48
17	F		05 15	02 05	05 00	02 00	04 46	01 54	05 31	02 12
18	S		06 14	02 29	05 59	02 23	05 45	02 17	06 30	02 35
19	M		07 13	02 52	06 58	02 46	06 44	02 41	07 29	02 58
20	T	Sun r. 6. 16.	08 12	03 15	07 58	03 10	07 43	03 04	08 28	03 22
21	F	Matthew Ev.	09 11	03 39	08 57	03 33	08 42	03 28	09 27	03 45
22	S		10 10	04 02	09 56	03 56	09 42	03 51	10 26	04 08
23	M	Pole Star.	11 10	04 25	10 55	04 20	10 41	04 14	11 26	04 32
24	T		12 09	04 49	11 54	04 43	11 40	04 37	12 25	04 55
25	F		13 08	05 12	12 54	05 06	12 39	05 01	13 24	05 18
26	S	Southernmost in Andromeda's	14 08	05 35	13 53	05 29	13 39	05 24	14 24	05 41
27	M	Girdle.	15 07	05 58	14 52	05 52	14 38	05 47	15 23	06 04
28	T		16 06	06 21	15 52	06 15	15 38	06 10	16 23	06 27
29	F	Sun r. 6. 30.	17 06	06 44	16 51	06 38	16 37	06 33	17 22	06 50
30	S		18 05	07 06	17 51	07 01	17 36	06 55	18 21	07 13

October hath XXXI Days.

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Month	Week Days	Remarkable days, and four-thing of Stars at Midnight.	First	Year	Second	Year	Third	Year	Leap	Year
			1741	1745	1742	1746	1743	1747	1744	1748
			1749	1753	1750	1754	1751	1755	1752	1756
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			≈	South	≈	South	≈	South	≈	South
1	A	Sun r. 6. 38	19 05	07 29	18 50	07 23	8 36	07 18	19 20	07 35
2	B		20 04	07 52	19 50	07 46	19 35	07 41	20 20	07 58
3	C		21 04	08 14	20 49	08 08	20 35	08 03	21 20	08 20
4	D		22 04	08 37	21 49	08 31	21 35	08 26	22 20	08 43
5	E		23 03	08 59	22 49	08 53	22 34	08 48	23 20	09 05
6	F		24 03	09 21	23 48	09 15	23 34	09 10	24 19	09 27
7	G		25 03	09 43	24 48	09 37	24 34	09 32	25 19	09 49
8	H		26 02	10 04	25 48	09 59	25 33	09 54	26 19	10 10
9	I		27 02	10 26	26 48	10 21	26 33	10 16	27 19	10 32
10	J	Andromeda's	28 02	10 48	27 48	10 43	27 33	10 37	28 18	10 54
11	K	Southermost	29 02	11 09	28 47	11 04	28 33	10 59	29 18	11 15
12	L	Foot.	☿ 02	11 30	29 47	11 25	29 33	11 20	☿ 18	11 36
13	M	Sun r. 7. 4.	01 02	11 51	☿ 47	11 46	☿ 33	11 41	01 18	11 57
14	N		02 02	12 12	01 47	12 07	01 33	12 02	02 18	12 18
15	O		03 02	12 33	02 47	12 28	02 33	12 22	03 18	12 38
16	P		04 02	12 53	03 47	12 48	03 33	12 43	04 18	12 59
17	Q		05 02	13 13	04 47	13 08	04 33	13 04	05 18	13 19
18	R	Luke Evan.	06 02	13 33	05 47	13 28	05 33	13 24	06 18	13 39
19	S		07 02	13 53	06 48	13 48	06 33	13 44	07 18	13 59
20	T		08 02	14 13	07 48	14 08	07 33	14 03	08 19	14 18
21	U		09 02	14 32	08 48	14 27	08 33	14 23	09 19	14 37
22	V		10 03	14 52	09 48	14 47	09 33	14 42	10 19	14 56
23	W		11 03	15 10	10 48	15 06	10 34	15 01	11 19	15 15
24	X		12 03	15 29	11 48	15 24	11 34	15 20	12 19	15 34
25	Y	Sun r. 7. 24.	13 03	15 47	12 49	15 43	12 34	15 38	13 20	15 52
26	Z		14 04	16 05	13 49	16 01	13 34	15 57	14 20	16 10
27	A		15 04	16 22	14 49	16 19	14 35	16 15	15 20	16 28
28	B	Simon & Jude	16 04	16 40	15 50	16 37	15 35	16 32	16 21	16 45
29	C		17 05	16 58	16 50	16 54	16 36	16 50	17 21	17 03
30	D		18 05	17 15	17 51	17 11	17 36	17 07	18 22	17 20
31	E	Sun r. 7. 23.	19 06	17 32	18 51	17 28	18 36	17 24	19 22	17 36

Month	Week Days	Remarkable days, and something of Stars at Midnight	First	Year	Second	Year	Third	Year	Leap	Year
			1741	1745	1742	1746	1743	1747	1744	1748
			1749	1753	1750	1754	1751	1755	1752	1756
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ plac	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			♐	South	♐	South	♐	South	♐	South
1	D	All Saints	20 06	17 48	19 52	17 44	19 37	17 40	20 23	17 53
2	E	Sun r. 7. 36	21 07	18 04	20 52	18 00	20 37	17 56	21 23	18 08
3	F		22 07	18 20	21 53	18 16	21 38	18 12	22 24	18 24
4	G	K. Wil. Nat.	23 08	18 35	22 53	18 32	22 38	18 28	23 24	18 40
5	A	Powder Plot	24 08	18 50	23 54	18 47	23 39	18 43	24 25	18 55
6	B		25 09	19 05	24 54	19 02	24 40	18 58	25 26	19 09
7	C		26 10	19 20	25 55	19 16	25 40	19 13	26 26	19 24
8	D		27 10	19 34	26 56	19 30	26 41	19 27	27 27	19 38
9	E		28 11	19 48	27 56	19 44	27 42	19 41	28 28	19 25
10	F		29 12	19 01	28 57	19 58	28 42	19 54	29 28	20 05
11	G	Martin B.	♂ 13	20 14	29 58	20 11	29 43	20 07	♂ 29	20 17
12	A		01 13	20 27	♂ 59	20 24	♂ 44	20 20	01 30	20 30
13	B	Sun r. 7. 53	02 14	20 39	01 59	20 36	01 45	20 33	02 31	20 42
14	C		03 15	20 51	03 00	20 48	02 45	20 45	03 31	20 54
15	D		04 16	21 02	04 01	20 59	03 46	20 57	04 32	21 05
16	E	Aldebaran.	05 17	21 13	05 02	21 10	04 47	21 08	05 33	21 16
17	F		06 17	21 24	06 03	21 21	05 48	21 19	06 34	21 27
18	G		07 18	21 34	07 04	21 32	06 49	21 29	07 35	21 37
19	A		08 19	21 44	08 04	21 42	07 50	21 39	08 36	21 47
20	B		09 20	21 53	09 05	21 51	08 51	21 49	09 37	21 56
21	C		10 21	22 03	10 06	22 00	09 52	21 58	10 38	22 05
22	D		11 22	22 11	11 07	22 09	10 52	22 07	11 39	22 13
23	E		12 23	22 19	12 08	22 17	11 53	22 15	12 40	22 21
24	F	Sun r. 8. 5.	13 24	22 27	13 09	22 25	12 54	22 23	13 41	22 29
25	G	Capella, or	4 25	22 34	14 10	22 33	13 55	22 31	14 42	22 33
26	A	the Goat.	5 26	22 41	15 11	22 40	14 56	22 38	15 43	22 43
27	B	Orion's Left	6 27	22 48	16 12	22 46	15 58	22 45	16 44	22 45
28	C	Foot.	7 28	22 54	17 13	22 52	16 59	22 51	17 45	22 53
29	D	Bull's Horn.	8 29	22 59	18 14	22 58	18 00	22 57	18 46	23 00
30	E	Andrew Ap.	9 30	23 04	19 15	23 03	19 01	23 02	19 47	23 05

December hath XXXI Days.

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Month	Week Days	Remarkable days, and four-thing of Stars at Midnight.	First	Year	Second	Year	Third	Year	Leap	Year								
			1741	1745	1742	1746	1743	1747	1744	1748								
			1749	1753	1750	1754	1751	1755	1752	1756								
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec								
			D	M	D	M	D	M	D	M	D	M	D	M				
			♂	South	♂	South	♂	South	♂	South	♂	South	♂	South				
1	F	First in Ori-	20	31	23	09	20	17	23	08	20	02	23	06	20	48	23	10
2	G	on's Belt.	21	32	23	13	21	18	23	12	21	03	23	11	21	49	23	14
3	H	Last in Orion's	22	34	23	16	22	19	23	16	22	04	23	15	22	50	23	17
4	B	Belt.	23	35	23	19	23	20	23	19	23	05	23	18	23	51	23	20
5	E	Orion's right	24	36	23	22	24	21	23	22	24	06	23	21	24	53	23	23
6	D	shoulder, and	25	37	23	24	25	22	23	24	25	07	23	24	25	54	23	25
7	F	Auriga's right	26	38	23	26	26	23	23	26	26	08	23	26	26	55	23	27
8	F	shoulder.	27	39	23	28	27	24	23	27	27	10	23	27	27	56	23	28
9	G		28	41	23	29	28	26	23	28	28	11	23	28	28	57	23	29
10	H		29	42	23	29	29	27	23	29	29	12	23	29	29	58	23	29
11	B	Shortest Day.	Yp	43	23	29	Vs	28	23	29	Yp	13	23	29	Yp	59	23	29
12	E		01	44	23	28	01	29	23	28	01	14	23	29	02	00	23	28
13	D	Foot of the	02	45	23	27	02	30	23	28	02	15	23	28	03	02	23	27
14	E	Great Dog.	03	46	23	26	03	31	23	26	03	16	23	27	04	03	23	25
15	F	Bright Star	04	48	23	24	04	33	23	24	04	18	23	25	05	04	23	23
16	G	of Gemini.	05	49	23	21	05	34	23	22	05	19	23	23	06	05	23	21
17	H	Sun r. 8. 11.	06	50	23	18	06	35	23	19	06	20	23	20	07	06	23	18
18	B	Mouth of the	07	51	23	15	07	36	23	16	07	21	23	17	08	08	23	14
19	E	Great Dog, or	08	52	23	11	08	37	23	12	08	22	23	13	09	09	23	10
20	D	Syrus.	09	53	23	07	09	38	23	08	09	24	23	09	10	10	23	06
21	E	Thomas Ap.	10	54	23	02	10	40	23	03	10	25	23	04	11	11	23	01
22	F		11	56	22	57	11	41	22	58	11	26	22	59	12	12	22	55
23	G	Sun r. 8. 8.	12	57	22	51	12	42	22	53	12	27	22	54	13	13	22	49
24	H		13	58	22	45	13	43	22	47	13	28	22	48	14	15	22	43
25	B	Nat. Christ.	14	59	22	38	14	44	22	40	14	29	22	42	15	16	22	37
26	E	St. Stephen.	16	00	22	31	15	45	22	33	15	31	22	35	16	17	22	29
27	D	John Evan.	17	01	22	24	16	47	22	26	16	32	22	28	17	18	22	22
28	E	Innocents	18	03	22	16	17	48	22	18	17	33	22	20	18	19	22	14
29	F	Castor.	19	04	22	08	18	49	22	10	18	34	22	12	19	20	22	05
30	G	Pollux.	20	05	21	59	19	50	22	01	19	35	22	03	20	22	21	56
31	H	Sun r. 8. 1.	21	06	21	49	20	51	21	52	20	36	21	54	21	23	21	47

A Table of the Variation of the Sun's Declination to every 1
Degrees of Longitude from the Meridian of *London*.

Degrees of Longitude from the Meridian of London.

Daily Variat	Deg 15	Deg 30	Deg 45	Deg 60	Deg 75	Deg 90	Deg 105	Deg 120	Deg 135	Deg 150	Deg 165	Deg 180
Min.	min	min	min	min	min	min	min	min	min	min	min	min
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	03	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	02	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	01	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	07	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

IN every Page there is 11 Columns, the first shews the Day of the Month, the second the Day of the Week, expressed by the Letters A, B, C, &c. the third the Southing of several Stars at Midnight, at which time the said Stars are to be observed, thereby to find the Latitude; in the same Column is given the time of Sun-rising (and by subtracting the time of rising from 12 Hours, gives the time of setting) the eight following Columns shew the Sun's Place and Declination for the First, Second, Third, and Leap-Year, according to their respective Titles.

For the more ready knowing of Leap-Year, the following Table is inserted, where it is found by Inspection, as also follow the First, Second, or Third Years after Leap-Year.

First Year	Second Year	Third Year	Fourth Year
1741	1742	1743	1744
1745	1746	1747	1748
1749	1750	1751	1752
1753	1754	1755	1756
1757	1758	1759	1760
1761	1762	1763	1764
1765	1766	1767	1768
1769	1770	1771	1772

The Use of the Kalendar.

To find the Day of the Week, or Month, for any Time past, or to come, by the Kalendar.

First, Find the Dominical Letter for the Year, then proceed as follows.

Example 1. Suppose it were required to find what Day of the Month will be the third *Wednesday* in *March*, 1746.

Having found the Dominical Letter by the Directions in Page 22, or by the Table in Page 39, to be E, turn to the Month of *March*, and account E for *Sunday*, then the Letter A is for *Wednesday*, and the third *Wednesday* is the 19th of *March*, which was required.

Example 2. What Day of the Week will the second of *September* be on in the Year 1744.

This Year being Leap Year has two Dominical Letters, A and G; the first Letter, to wit A, serving from the first of *January* to the end of *February*; the last Letter, to wit G, serves from thence to the Years-end.

Wherefore looking against the second of *September*, there stands G, which represents *Sunday*, the Day of the Week required.

Note, That the *Gregorian*, or *Foreign Account*, begins 11 Days before ours; so that our first of *January* is their 12th; our 12th their 23d; our 23d their 3d of *February*; our 24th of *February* is their 7th of *March*: But in Leap-Year our 24th of *February* is their 6th of *March*; because then *February* hath 29th Days.

To

To find the Sun's Place and Declination by the Kalendar.

Example 1. Suppose the Sun's Place and Declination be required on the 10th of *January* 1745, being the first after Leap-Year.

In the Month of *January*, in the first Column look the Day of the Month, over against which, under the first Year stands 1.32, that is, the Sun's Place is in 1 deg. 32 min. of *Aquarius*: In the next Column under the said Year stands 19.51, under the Title South, which shews the Declination to be 19 deg. 51 min. Southerly; and this serves for the Year 1745; on the said 10th of *January*, being the first after Leap-year.

Example 2. Suppose the Sun's Place and Declination to be required on the 10th of *March*, 1744, being Leap-year.

In the Month of *March*, in the first Column find the Day of the Month, over-against which, under Leap-year, stands 1.07, which shews the Sun's Place to be in 1 deg 7 min. of *Aries*; and in the next Column under Leap-year stands 00.27, which shews the Declination to be 27 min. Northerly, which was required.

Although it is common to take the Declination as it is in the Kalendar, yet if the Difference of Longitude be considerable from *London*, it is requisite the Declination should be corrected, because in the Kalendar it is calculated to the Meridian of *London*, for which End the *Table of the Variation of the Sun's Declination to every 15 Degrees of Longitude from the Meridian of London*, immediately following the Kalendar is added; the Use and Explanation whereof follows.

IN the first Column is the daily Variation, which is found by subtracting the Declination of the given Day of the Month, from the Declination for the Day following; or contrarily this from that, that is the lesser from the greater, and the Difference is the daily Variation. In the Head of the other Columns are Degrees of Longitude from *London*, either Easterly or Westerly, and in those Columns under the respective deg. of Longitude, are the Minutes of Declination, answerable to the daily Variation. As suppose the daily Variation were 10 min. and the Difference of Longitude 90 deg. against 10 in the first Column, and under 90 deg. at the Head of the Table, stands 2 Minutes, which answers thereto, and are to be used as follows.

The Use of the Table of the Variation of the Sun's Declination.

The Rule. First, If the Difference of Longitude be Westerly, and the Declination increasing, the Variation found in this Table must be added to the Declination found in the Kalendar; but if the Declination be decreasing, it must be subtracted therefrom.

Secondly, If the Difference of Longitude be Easterly, and the Declination increasing, the Variation aforesaid must be subtracted; but the Declination decreasing must be added.

Examp. 1. April the 19th, 1744, being at Sea, the Difference of Longitude from the Meridian of *London* being 90 degrees Westerly, I find the Declination

Declination in the Kalendar to be 14 deg. 56 min. North; and the 20th Day, the Declination is 15 deg. 14 min. therefore subtracting the lesser Declination from the greater, the Remainder is 18 min. which is the daily increase. Then in the Table under 90 deg. and over-against 18, stands 4 min. (which because the Difference of Longitude is Westerly, and the Declination increasing) must be added to 14 deg. 56 min. before found, which makes the true Declination 15 deg. 00 min. North.

If the Difference of Longitude in this Case had been Easterly, the 4 min. found in the Table must have been subtracted.

Note, It is easily discerned, whether the Declination increase or decrease, by observing whether the Declination for the Day following be greater or lesser; for if it be greater, then it increases; but if less, then it decreases.

Examp. 2. January the 10th 1745, being at Sea, the Difference of Longitude from London being 120 deg. Westerly, I find the Declination in the Kalendar to be 19 deg. 51 min. South, and the 11th Day it is 19 deg. 38 min. therefore subtracting the lesser from the greater, the Difference is 13 min. which is the daily decrease; then in this Table under 120 deg. and against 13 stands 4 min. which (because the Difference of Longitude is Westerly, and the Declination decreasing) must be subtracted, which makes the true Declination 19 deg. 47 min. South. If the Difference of Longitude had been Easterly, the 4 min. must have been added.

The Use of the Sun's Declination to find the Latitude.

The Declination of the Sun is most useful at Sea, with the Complement of the Sun's Meridian Altitude (commonly called the Zenith Distance) taken with a Quadrant or Cross-staff, to find the Latitude of the Place; for which take the following Rules.

Rule 1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Meridian Altitude is the Latitude North.

Example. Suppose being at Sea, the 10th of April 1744, the Declination found by the Table is 12 deg. 02 min. North, the Sun comes to the Meridian in the South; the Complement of the Meridian Altitude by Observation is 23 deg. 10 min. What is the Latitude?

Complement of the Meridian Altitude is — 23° 10' South

Declination of the Sun is — 12 02 North

The Latitude of the Place is — 35 12 North

Rule 2. If the Sun comes to the Meridian in the North and hath North Declination, then subtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude North. But if the Complement of the Altitude exceed the Declination, subtract the Declination therefrom, and the Remainder is the Latitude South.

Example 1. Suppose being at Sea, May 20, 1744, the Declination being 22 deg. 00 min. North, the Sun comes to the Meridian in the North, and by observing with a Quadrant the Sun's Zenith Distance is 18 deg. 42 min. What is the Latitude of the Place?

Declination

Sun's Declination is _____ $22^{\circ} 00'$ North

Sun's Zenith Distance _____ $18 42$ North

The Latitude is _____ $3 18$ North

Example 2. Suppose being at Sea, *June 10th, 1745*, the Sun's Declination by the Table is $23 \text{ deg. } 29 \text{ min. North}$, the Complement of the Meridian Altitude, by Observation, is $33 \text{ deg. } 10 \text{ min.}$ the Sun comes to the Meridian in the North.

Sun's Complement Meridian Altitude is _____ $33^{\circ} 10'$ North

Sun's Declination _____ $23 29$ North

The Latitude is _____ $9 41$ South

Rule 3. If the Sun comes to the Meridian in the North, and have South Declination, the Declination added to the Complement of the Altitude is the Latitude South.

Example 2. Suppose being at Sea, *January 29th, 1748*, the Sun comes to the Meridian in the North, the Complement of the Meridian Altitude is $22 \text{ deg. } 10 \text{ min.}$ What is the Latitude?

Complement Sun's Meridian Altitude is _____ $22^{\circ} 10'$ North

Sun's Declination by the Table _____ $14 49$ South

The Latitude is _____ $36 59$ South

Rule 4. If the Sun comes to the Meridian in the South, and have South Declination, subtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude South. But if the Complement of the Meridian Altitude exceed the Declination, subtract the Declination therefrom, the Remainder is the Latitude North.

Example 1. Suppose being at Sea, *January 1st, 1744*, the Sun coming to the Meridian in the South: The Complement of the Altitude is $10 \text{ deg. } 36 \text{ min.}$ What is the Latitude?

Sun's Declination _____ $21^{\circ} 44'$ South

Complement Meridian Altitude _____ $10 36$ South

Latitude of the Place _____ $11 08$ South

Example 2. Suppose being at Sea, *February 18, 1746*, the Sun coming to the Meridian in the South, the Complement of the Meridian Altitude is $25 \text{ deg. } 20 \text{ min.}$ What is the Latitude?

Complement Sun's Meridian Altitude _____ $25^{\circ} 20'$ South

Sun's Declination _____ $07 35$ South

Latitude _____ $17 45$ North

Rule 5. If the Sun be in the Zenith (that is right over head) if it have either North or South Declination, the Declination is the Latitude either North or South.

Rule 6. If the Sun have no Declination, the Complement of the Meridian Altitude is the Latitude which is North or South, according as the Ship is to the Northward or Southward of the Sun.

Days	Jan.		Februar		March.		April.		May.		June.	
	☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
1	19	36	21	43	23	29	01	22	03	15	05	20
2	19	40	21	47	23	33	01	26	03	19	05	24
3	19	44	21	51	23	37	01	30	03	23	05	28
4	19	49	21	55	23	40	01	34	03	27	05	32
5	19	53	21	59	23	44	01	37	03	31	05	37
6	19	57	22	03	23	47	01	41	03	35	05	41
7	20	01	22	07	23	51	01	45	03	39	05	45
8	20	05	22	11	23	54	01	48	03	43	05	49
9	20	09	22	15	23	58	01	52	03	47	05	53
10	20	14	22	18	00	02	01	55	03	51	05	57
11	20	18	22	22	00	06	01	59	03	55	06	01
12	20	23	22	26	00	09	02	03	03	59	06	05
13	20	27	22	30	00	13	02	07	04	03	06	09
14	20	31	22	34	00	16	02	11	04	07	06	13
15	20	35	22	37	00	20	02	14	04	11	06	18
16	20	39	22	41	00	24	02	18	04	15	06	22
17	20	43	22	45	00	27	02	22	04	19	06	27
18	20	47	22	49	00	31	02	26	04	23	6	30
19	20	51	22	53	00	34	02	30	04	27	06	34
20	20	55	22	56	00	38	02	33	04	31	06	39
21	20	59	23	00	00	42	02	37	04	35	06	43
22	21	04	23	04	00	45	02	41	04	39	06	47
23	21	08	23	07	00	49	02	45	04	43	06	51
24	21	12	23	11	00	53	02	49	04	47	06	55
25	21	16	23	15	00	56	02	52	04	51	06	59
26	21	20	23	18	01	00	02	56	04	55	07	03
27	21	24	23	22	01	04	03	00	04	59	07	07
28	21	28	23	26	01	07	03	04	05	08	07	11
29	21	32			01	11	03	08	05	07	07	15
30	21	36			01	15	03	11	05	12	07	20
31	21	39			01	18			05	16		

Days	July		August.		Septem.		October.		Novem.		Decem.	
	☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
1	07	24	09	26	11	20	13	09	15	08	17	16
2	07	28	09	30	11	24	13	13	15	12	17	21
3	07	32	09	34	11	27	13	16	15	16	17	26
4	07	36	09	38	11	31	13	20	15	20	17	30
5	07	40	09	41	11	34	13	23	15	24	17	35
6	07	44	09	45	11	37	13	27	15	28	17	39
7	07	48	09	49	11	42	13	31	15	32	17	43
8	07	52	09	52	11	45	13	35	15	37	17	47
9	07	56	09	56	11	49	13	39	15	41	17	52
10	08	00	09	59	11	52	13	42	15	46	17	57
11	08	04	10	03	11	56	13	46	15	50	18	01
12	08	08	10	07	12	00	13	50	15	54	18	06
13	08	12	10	11	12	03	13	54	15	59	18	10
14	08	16	10	15	12	07	13	58	16	03	18	15
15	08	20	10	18	12	10	14	01	16	08	18	20
16	08	24	10	22	12	14	14	05	16	12	18	24
17	08	28	10	26	12	18	14	09	16	16	18	29
18	08	32	10	29	12	21	14	13	16	20	18	34
19	08	36	10	33	12	25	14	17	16	24	18	38
20	08	40	10	36	12	28	14	21	16	29	18	42
21	08	44	10	40	12	32	14	25	16	33	18	46
22	08	48	10	44	12	36	14	29	16	37	18	50
23	08	52	10	48	12	39	14	33	16	41	18	55
24	08	56	10	51	12	43	14	37	16	45	18	59
25	08	59	10	54	12	45	14	40	16	50	19	04
26	09	03	10	58	12	50	14	44	16	54	19	08
27	09	07	11	02	12	54	14	48	16	58	19	12
28	09	11	11	05	12	58	14	52	17	03	19	17
29	09	15	11	09	13	02	14	56	17	07	19	21
30	09	18	11	12	13	06	15	00	17	12	19	26
31	09	22	11	16			15	04			19	31

A T A B L E, shewing the Right Ascension, Declination, and Magnitude of the Principal fixed Stars.

Names of the Stars.	Magnitude.	Right Ascen. H. M.	Declination. D. M.	
P O L E Star	2	00 32	87 51	N
Girdle of Andromeda	2	00 50	33 50	N
Bright Star of Aries	2	01 52	22 10	N
Medusa's Head	2	02 49	39 54	N
Bright Side of Perseus	2	03 05	48 52	N
Adebaran, or Bull's Eye	1	04 18	15 55	N
Capella, or the Goat	1	04 55	45 41	N
Bright Foot of Orion	1	05 01	08 33	S
Middle Star in Orion's Belt	3	05 20	01 25	S
Orion's Right Shoulder	1	05 39	07 19	N
Auriga's Right Shoulder	2	05 44	44 53	N
Bright Foot of Gemini	2	06 19	16 38	N
Syrus, or the Great Dog	1	06 33	16 21	S
Castor, or Northernmost Twin	2	07 16	32 27	N
Procyon, or the Little Dog	2	07 24	05 54	N
Pollux, or Southernmost Twin	2	07 25	28 39	N
Hydra's Heart	1	09 14	07 29	S
Lyon's Heart, or Regulus	1	09 54	13 16	N
The Lower of the Pointers	2	10 41	57 50	N
The Upper of the Pointers	2	10 43	63 13	N
Lyon's Tail	1	11 31	16 05	N
Upper of the two last in the Square of the Great Bear	2	12 02	58 34	N
Last but two in the Great Bear's Tail	2	12 40	57 27	N
Virgin's Spike	1	13 11	09 44	S
Last but one in the Great Bear's Tail	2	13 10	56 21	N
Last in the Great Bear's Tail	2	13 34	50 42	N
Arcturus	1	14 02	20 38	N
South Ballance	2	14 32	14 54	S
Foremost Guard	2	14 51	75 15	N
Brightest of the Crown	2	15 21	25 38	N
Brightest in the Serpent's Neck	2	15 33	07 18	N
Antares, the Scorpion's Heart	1	16 12	25 47	S
Head of Hercules	3	17 02	14 43	N
Ophiucus, or Serpent's Head	3	17 22	12 47	N

A Table of the Fixed Stars.

<i>Lyræ, or the Harp</i>	1	18	27	38	33	N
<i>Swan's Bill</i>	3	19	17	27	29	N
<i>Vulture, or Eagle's Heart</i>	2	19	34	08	10	N
<i>Swan's Tail</i>	2	20	30	44	19	N
<i>Mouth of Pegasus</i>	3	21	27	08	39	N
<i>Fomelhaut</i>	1	22	41	31	03	S
<i>Marchab, or Pegasus Wing</i>	2	22	48	13	44	N
<i>Scheat, or Pegasus Leg</i>	2	22	50	26	36	N
<i>Cephus's Knee</i>	3	23	20	76	07	N
<i>Andromeda's Head</i>	2	23	53	27	35	N
<i>End of Pegasus's Wing</i>	2	23	57	13	39	N

The Explanation and Use of the TABLE of the Sun's Right Ascension, and of the Table of the Star's Right Ascension and Declination.

IN the Table of the *Sun's Right Ascension*, the first Page contains the first six Months of the Year ; the next Page the other six Months ; at the Head of the Table are the *Months* ; in the first Column towards the Left Hand are the *Days of the Month*, and in the opposite Column is the *Right Ascension in Hours and Minutes*.

In the Table of the *Fixed Stars*, there are four Columns ; in the first towards the Left-hand, are the *Names of the Stars* ; in the second, the *Star's Magnitude* ; in the third, the *Right Ascension in Hours and Minutes* ; in the fourth, their *Declination* in Degrees and Minutes, North or South.

First, To find the Time of the Star's coming upon the Meridian.

The Rule. Look the Right Ascension of the Sun and Star, and subtract the Right Ascension of the Sun from the Right Ascension of the Star, but if the Star's Right Ascension be less than the Sun's, add thereto 24 Hours, and then subtract ; the Remainder after Subtraction, is the Time of the Star's coming upon the Meridian from Noon ; but if the Remainder exceed 12 Hours, subtract 12 Hours therefrom, and then the Remainder is the Time from Midnight.

Example 1. Suppose the Time that *Fomelhaut* comes upon the Meridian on the 10th of *October* is required.

I find in the Table that Star's Right Ascension to be 22 Hours 41 min. and the Sun's to be 13 Hours 42 min. which subtracted from the Star's Right Ascension, leaves 8 Hours 59 min. the Time of the Star's coming upon the Meridian, Afternoon.

Example 2. Suppose the Time that the *Bull's Eye* comes upon the Meridian on the 15th of *October* were required.

I find the Star's Right Ascension to be 4 Hours 18 min. the Sun's 14 Hours 1 min. Now because the Sun's Right Ascension is more than the Star's, add
to

to the Star's Right Ascension 24 Hours, which makes 28 Hours 18 min. from which subtracting the Sun's Right Ascension 14 Hours 1 min. there remains 14 Hours 17 min. from which subtracting 12 Hours, there remains 2 Hours 17 min. which is the Time of the Star's Southing after Midnight, as was required.

Secondly, The Time being given, to find what Star will come to the Meridian about the same Time.

The Rule. To the Sun's Right Ascension add the Time from Noon, at which the Star's coming to the Meridian is desired; the Sum is the Right Ascension of the Star that will come to the Meridian at that Time; with which enter the Table of the Star's Right Ascension and Declination, where look what Star's Right Ascension agrees with the Right Ascension before found, or nearest thereto, and that is the Star sought for.

Example. Suppose *March 27th*, I desire to know what Star will come upon the Meridian about 8 at Night.

The Sun's Right Ascension is 1 Hour 4 Minutes; the Time from Noon is 8 Hours, which added to the Sun's Right Ascension, makes 9 Hours 4 Minutes: The nearest in the Table is *Hydra's Heart*, whose Right Ascension is 9 Hours 14 Minutes, and therefore South's at 8 Hours 8 Minutes, and so in others.

Directions for Observations of the Stars, to find the Latitude of the Place.

Having before shewn how to find the Time of a Star's coming to the Meridian, I shall now shew by the Star's Altitude, how to find the Latitude.

Note, In North Latitude, those Stars whose North Declination exceed the Complement of the Latitude may be observed under the Pole. And the same may be performed by the Southern Stars in South Latitude.

Directions for finding the Latitude, by the Meridional Altitude of the Fixed Stars.

Rule 1. If the Star comes to the Meridian in the South, and hath North Declination, the Complement of the Altitude (by Observation) added to the Declination of the Star, found in the Table of the Star's Right Ascension and Declination, gives the Latitude North.

Example. On the 10th of *January*, being at Sea, I find by the foregoing Directions, that the *Lyon's Heart* comes to the Meridian in the South at 1 Hour 37 min. after Midnight, the Meridian Altitude by Observation was 63 Degrees; which subtracted from 90 Degrees, there remains 27 Degrees the Complement of the Altitude; to which adding 13 Degrees 16 Minutes the Declination of the Star North, gives 40 Degrees 16 Minutes the Latitude of the Place North, which was required.

Rule 2. If a Star comes to the Meridian in the South, and have South Declination, subtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North. But if the Declination exceed the

the Complement of the Altitude, subtract the Complement of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1. Suppose on the 10th of *July*, being at Sea, the Star *Fomel-baut* coming to the Meridian in the South, at 2 Hours 41 m. after Midnight, the *Merid. Alt.* 35 deg. 50 min. the Compl. whereof is 54 deg. 10 min. the Star's Declination is 31 deg. 03 min. South, which subtracted from the Complement of Alt. leaves 23 deg. 07 min. which is the Latitude North.

Example 2. Suppose on the 20th of *June*, being at Sea, the *Scorpion's Heart* comes to the Meridian in the South at 9 Hours 33 min. at Night, the Complement of the Altitude is 5 deg. 27 min. the Declination 25 Degrees 47 minutes South; from which subtracting the Complement of the Altitude, there remains 20 deg. 20 min. which is the Latitude South.

Rule 3. If a Star comes to the Meridian in the North, above the Pole, and have North Declination, subtracting the Declination from the Complement of the Altitude, the Remainder is the Latitude South. But if the Declination exceeds the Complement of the Altitude, subtract the Complement of the Altitude therefrom, the Remainder is the Latitude North.

Example 1. On the 11th of *June* the *brightest in the Harp* comes to the Meridian in the North at 26 minutes after Midnight, the Complement of the Altitude is 79 degrees, from which subtracting the Declination, which is 38 deg. 33 min. North, there remains 40 degrees 27 minutes, which is the Latitude South.

Example 2. On the 11th of *September* *Andromeda's Head* comes to the Meridian in the N. at 8 min. after Midnight, the Complement of the Altitude is 7 deg. 10 min. which subtracted from the Declination 27 deg. 35 min. gives 20 deg. 25 min. which is the Latitude North.

Rule 4. If a Star comes to the Meridian in the North, and have South Declination, the Complement of the Altitude added to the Declination gives the Latitude South.

Example. On the 12th of *December*, (*Syrius or the Great Dog's Mouth*) comes to the Meridian in the North at 26 minutes after Midnight, the Complement of the Altitude is 30 deg. to which adding 16 deg. 20 min. the Declination South, gives 46 deg. 20 min. the Latitude South.

Rule 5. If a Star comes to the Meridian, under the Pole, then add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude either North or South, according to the Star's Declination.

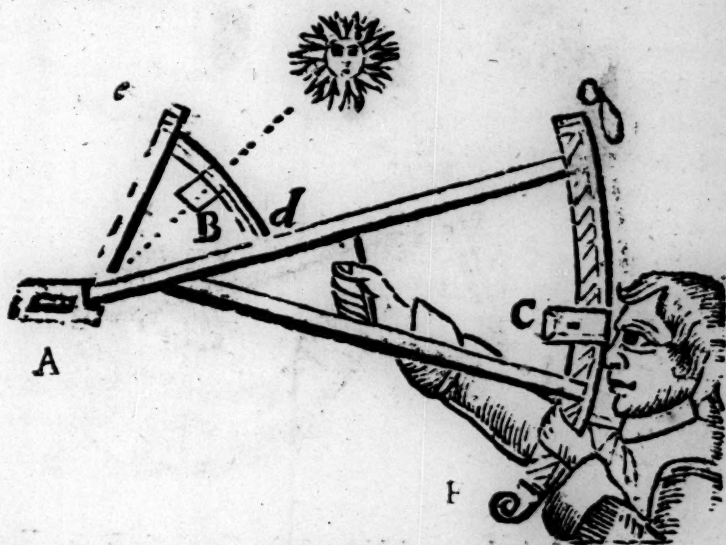
Example. On the 10th of *March*, the Pole Star comes to the Meridian under the Pole at 30 min. after Midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the Declination 2 deg. 09 min. which added together gives 46 deg. 39 min. which is the Latitude North.

Rule 6. If the Star be in the Zenith, the Declination is the Latitude, either North or South, according to the Declination of the Star.

Rule 7. If the Star have no Declination, the Complement of the Meridian Altitude is the Latitude of the Place either North or South, according as the Star is either to the Northward or Southward.

The Description and Use of the Sea-Quadrant.

THIS Instrument consists of three Vanes and two Arches, the Horizon Vane, which in observing, respects the Horizon, as at A. The Shade Vane, so called because of its giving the Shadow upon the Horizon Vane in Time of Observation, as at B. Lastly, the Sight Vane, which in Time of Observation is placed at the Eye, through which the Shadow and Horizon are seen, as at C. The lesser of the Arches mark'd with *d e*, is called the *Sixty-Arch*, because it contains 60 (or more commonly of late 65) Degrees. In Time of Observation, the Shade Vane is placed upon this Arch always to an even Degree; it is numbred from the upper-end at *e*, downward to *d*, with 5, 10, 15, 20, &c. The bigger Arch marked with *g f*, is called the *Thirty Arch*, because it contains 30 (or rather 25) Degrees, it is divided into Degrees and Minutes.

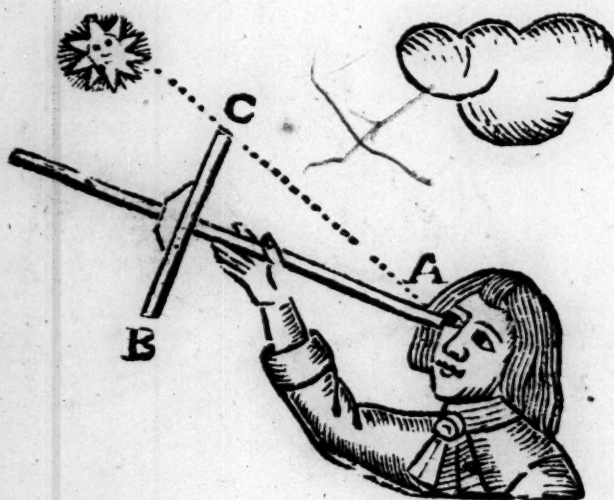


The Use of this Instrument is to take the *Sun's* Meridian Altitude, which is done in the manner following.

Put the Horizon Vane upon the End of the Quadrant at A, the Shade Vane upon the Sixty (or lesser Arch) to a Number of Degrees less than the Complement of the Altitude by 15 or 20d. and the Sight Vane upon the Thirty Arch. The Vanes being thus fixed upon the Quadrant, your Back being turned towards the Sun, and the Sight Vane placed to the Eye, look thro' the said Sight Vane, and cause the Shadow of the upper Edge of the Shade Vane to fall upon the upper Part of the Slit in the Horizon Vane, where usually (for Perspicuity Sake) there is drawn a black Line; and if at the same Time the Horizon appear thro' the said Slit in the Horizon Vane, that is the Sun's present Altitude; but if the Sea appear instead of the Horizon, then slide the Sight Vane lower towards F; if the Sky appear instead of the Horizon, then slide the Sight Vane a little higher, until the Horizon appear through the Horizon Vane. But to obtain the Meridian Altitude

64 *The Use of the Quadrant, Fore-staff, and Nocturnal.*

Altitude, which is the greatest Altitude the Sun will have that Day, and is the Thing used to find the Latitude, continue observing, and as the Sun rises, the Sea will appear through the Horizon Vane; then must the Sight Vane be removed lower: And thus continue observing, as often as may be convenient, till the Sun be at the highest, which is the Meridian Altitude. When the Sun begins to fall, the Sky will appear instead of the Horizon, and then it's Time to give over observing for that Day. Having thus done, add the Degrees upon the Sixty Arch to the Degrees and Minutes upon the Thirty Arch; and the Sum is the Complement of the Meridian Altitude; the Use of which for finding the Latitude, is sufficiently shewed in the preceding Rules.



The Description and Use of the Cross-staff, or Fore-staff.

THIS Instrument consists of a Staff and four Crosses, the first and shortest is called the Ten Cross, and it belongs to that Side of the Staff which is numbred from about 3 Degrees to 10 Degrees. Sometimes the Thirty Cross, and the rest of the Crosses are so made, as that the Breadth thereof serves instead of this Ten Cross.

The second Cross is called the Thirty Cross, and belongs to that Side of the Staff which is numbred from about 10 Degrees to 30.

The third Cross is called the Sixty Cross, and belongs to that Side of the Staff which is numbred from about 20 to 60 Degrees.

The fourth and last Cross is called the Ninety Cross, and belongs to that Side of the Staff, which is numbred from about 30 to 90 Degrees.

This Staff is likewise numbred with the Complement to 90 Degrees, (*viz.*) at 10 stands 80, at 20 stands 70, at 30 stands 60; and so of the rest.

The Use of this Instrument is to take the Meridian Altitude of the Sun or Stars, which is done as followeth.

First,

First, Consider how great the Sun's Meridian Altitude will be that Day ; and accordingly use the Cross most suitable (*viz.*) if the Meridian Altitude be judged to be under 10 deg. use the Tenth Cross ; if between 10 and 30, the Thirty Cross ; if between 30 and 60, the Sixty Cross ; if between 60 and 90, the Ninety Cross, which is seldom used.

Having put on the Cross, place the flat end of the Staff at A, to the outside of the Eye, as near as may be, without hindring the Sight : Thus the Face being towards the Sun or Star, hold the Cross upright ; then look at the upper End of the Cross at C for the Sun or Star, and at the lower End at B for the Horizon, and if the Sea appears instead of the Horizon, remove the Cross a little farther from the Eye ; but if the Sky appear instead of the Horizon, remove the Cross a little nearer to the Eye, until the Sun or Star appear at the upper End, and the Horizon at the lower End ; which when they do, then upon the Side of the Staff belonging to the Cross used in Observation, will be found the deg. and min. of Altitude of the Sun or Star. But the greatest Altitude being that which is required, Observation must be continued as frequently as Judgment shall direct, until the Sun or Star be at the highest ; and as the Sun or Star rises, the Sky will appear instead of the Horizon ; but when the Sun or Star is past the Meridian, and begins to fall, the Sea will appear instead of the Horizon, and then is the Observation finished ; and upon the side of the Staff proper to the Cross used, are found the deg. and min. of the Sun's Meridian Altitude ; which subtracted from 90 deg. gives the Complement of the Altitude ; or it may be taken off the Staff at once (the Staff being numbred with the Complement as is shewed before) with which to proceed in finding the Latitude of the Place, observe the Rules and Directions foregoing.

The Description and Use of the Nocturnal.

IT consists of three Parts, the first and unmoveable Part, on which is the Handle, by which to hold it in time of Observation ; upon the fore-side of which, in the outermost Circle, are the Days of the Month, and upon the innermost are set off the 24 Hours, and upon the Back-side are the 32 Points of the Compass.

There are two sorts of *Nocturnals*, the one made for the *Great Bear*, the other for the *Little Bear*. Those that are made for the *Great Bear* have *February* at the Top, but those that are made for the *Little-Bear* have *April*, but now they are commonly made for both *Bears*, having two Indexes.

The second, or middle Part, contains two Circles, and the aforesaid Indexes, one marked G, for the *Great Bear*, and the other marked L, for the

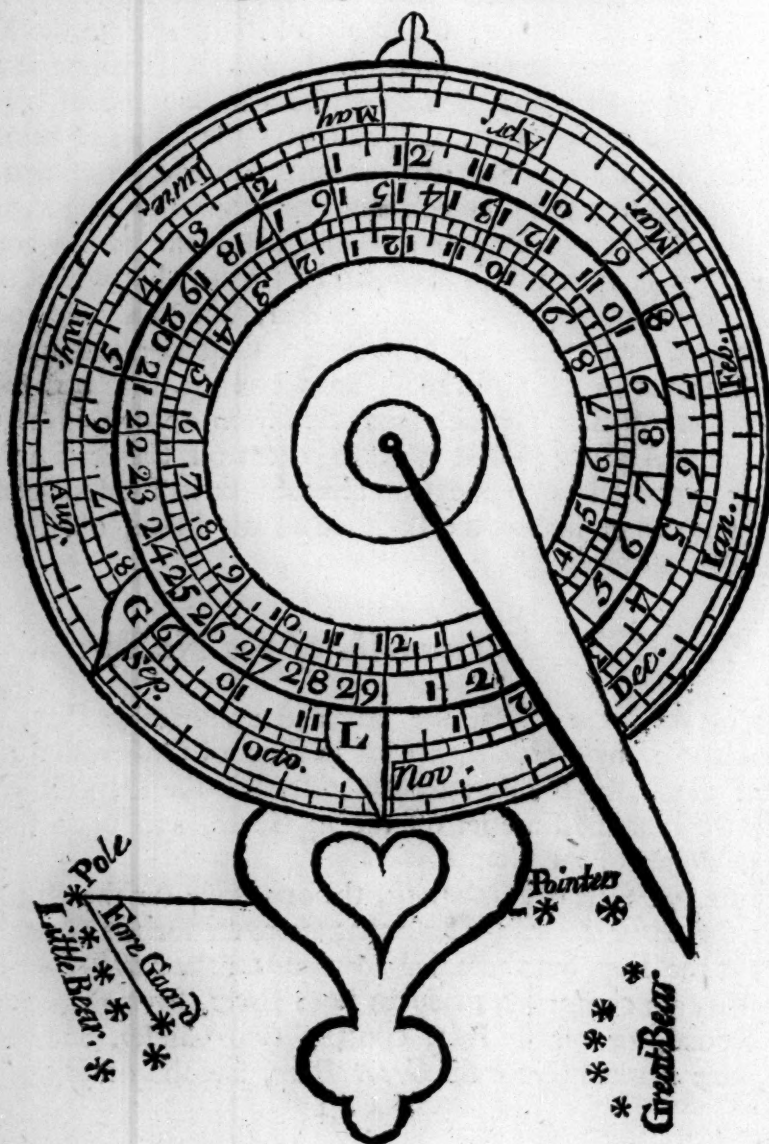
The Description of the Nocturnal.

the *Little Bear*. The outermost Circle is divided into 29 Days and a half, being the Moon's Age; the innermost into 24 Hours: The Index belonging to the *Bear* you intend to observe by, is to set to the Day of the Month at pleasure.

The third and uppermost Part is a long Index; the Edge of which (that respects the Center) must be turned to the Guards or Pointers, in Time of Observation.

To find the Hour of the Night, and upon what Point of the Compass the Guards are.

The Figure of the Nocturnal.



To do this, First, set the Index of the middle Part to the Day of the Month, then hold the Instrument upright, which may be discerned by the Tip on the Top of the *Nocturnal*, then look through the Hole in the Middle of the *Nocturnal* for the *North Star*; which having found, turn the Edge of the long Index to the Guards or Pointers, according as you observe by the *Little* or *Great Bear*, then shall the Edge of the Index (upon the innermost Circle of the middle Part) give the Hour of the Night.

Also in *Nocturnals* made for both Bears, you have on the back-side two Circles mark'd at the Bottom, the outermost with L, and the innermost with G; and numbred round with Degrees and Minutes, for finding how much the *Pole Star* is above or below the true Pole; to find which, having fitted the *Nocturnal* as before directed, observe what Figures on the Back-side fall under the Edge of the long Index, in the Circle belonging to the Bear by which you observe, and that is the Deg. and Min. that the Star is above or under the Pole, as is distinguish'd by the Words *Abo.* and *Und.*

Example. I observe by the *Great Bear*, *Sept. 6.* I set the Index marked G to *Sept. 6.* and looking through the Hole to the Pole, I turn the long Index till it lie just over the two Pointers, as you see in the Figure of the *Nocturnal*, and find on the innermost Circle of the middle Part of the *Nocturnal*, that it is Two a Clock in the Morning; and on the Back-side in the Circle marked G, I find the Pole Star is 2 deg. 26 min. above the Pole, &c. 'tis found also by the following Table.

To find the Moon's Southing, and Time of Full-Sea by the Nocturnal.

TO do this, it is but looking upon the middle Piece of the *Nocturnal*, and in the outermost Circle find the Moon's Age; and opposite to it in the innermost Circle of the same Piece stands the Southing.

Ex. Suppose the Moon 25 Days old, and the Time of her Southing required.

Look for 25 the Moon's Age in the outermost Circle, opposite to which in the innermost Circle stands 8, which is the Moon's Southing at 25 Days old required.

Note, That always between the Change and the Full, the Moon comes to South in the Afternoon, but after the Full in the Morning.

Thus having found the Moon's Southing, add thereto the Time of Flowing upon the Full and Change Days at any Place, and that gives the Time of full Sea when required. But this has been sufficiently shewed in another Place, and therefore needs no Example.

The Use of the following Table of the Declination of the North Star.

THE Use of the Table is this: Having taken the Alt. of the *Pole Star*, then observe with the *Nocturnal* upon what Point of the Compass the Guards are; opposite to which in this Table stands the Declination (so called) which if the Star be below the Pole, is to be added to the Alt. but if the Star be above the Pole, to be subtracted therefrom, to find the Latitude of the Place.

But the more exact Way to find the Latitude, is by those other Directions for the Stars before given.

A Table of the Declination of the North Star, upon every Point of the Compass the Guards are upon, for both Sorts of Nocturnals.

	Points of the Com- pafs.	For the Guard of the Little Bear.			For the Guards of the Great Bear, called the two Pointers.		
		D.	M.		D.	M.	
If the former of the Guards be ascending from the North or lower Part of the Meridian.	North	2	09	Above the Pole	2	20	Above the Pole.
	N by E	1	52		2	30	
	N N E	1	29		2	35	
	NE by N	1	02		2	33	
	North East	0	35		2	26	
	N E by E	0	06		2	13	
	E N E	0	22	The North Star is under the Pole	1	55	The North Star under the Pole.
	East by North	0	52		1	33	
	East	1	18		1	07	
	East by South	1	41		0	38	
	E S E	2	01		0	08	
	S E by E	2	16		0	22	
	South East	2	25		0	52	
	S E by S	2	30		1	20	
	S S E	2	29		1	44	
	South by East	2	22		2	04	
If the former of the Guards be descending from the South or upper Part of the Merid.	South	2	11	Above the Pole	2	20	Ab. the Pole
	South by West	1	55		2	30	
	S S W	1	34		2	29	
	S W by S	1	10		2	27	
	South West	0	43		2	23	
	S W by W	0	14		2	13	
	W S W	0	15	Above the Pole	1	55	
	West by South	0	44		1	33	
	West	1	11		1	07	
	West by North	1	36		0	38	
	W N W	1	58		0	08	
	N W by W	2	14	Above the Pole	0	22	
	North West	2	25		0	52	
	NW by N	2	30		1	20	
	N N W	2	29		1	44	
	North by West	2	22		2	04	

A Table of the Latitude and Longitude of the principal Harbours, Headlands, and Islands in the World; Corrected by the latest and best Observations; accounting the Longitude from the Meridian of the L I Z A R D.

Note, When the Latitude and Longitude of an Island is given, the middle of the Island is meant, except some particular Part of it be expressed.

Places Names.	Latitude North.	Longit E. or W.	Places Names.	Latitude N or S.	Longit. E. or W.
The Coast of England.	D. M.	D. M.		D. M.	D. M.
B erwick ———	55 50	03 35 E	North Part of Lewis Island }	58 20	02 01 W
Newcastle ———	54 58	03 44 E	St. Kilday ———	58 02	04 51 W
Stockton ———	54 33	03 49 E	Farra Head ———	58 23	00 09
Spurn ———	53 35	05 44 E	Northern Isles of Orkney }	59 13	01 44
Yarmouth ———	52 45	06 54 E	Sherland S. Point	59 52	03 44
LONDON ———	51 32	05 14 E	Buchaness ———	57 55	00 54
North Foreland	51 28	06 24 E	Aberdeen ———	57 24	03 37
Beachy ———	50 48	05 39 E	Dundee ———	56 30	02 38
Dunnose Isle Wight	50 38	03 51 E	Edenburgh ———	55 57	02 28
Portland ———	50 30	02 26 E	The Coast of Ireland.		
Start Point ———	50 06	02 29 E	Dublin ———	53 20	01 52
L I Z A R D ———	49 57	00 00	Wexford ———	52 13	02 02
Land's-end ———	50 06	00 46 W	Waterford ———	52 07	02 38
St. Mary Scilly	49 57	01 31 W	Cork ———	51 49	04 16
Hartland Point	51 06	00 39 E	Cape Clear ———	51 10	05 16
Lundy Isle ———	51 20	00 34 E	Limrick ———	52 22	04 34
Bristol ———	51 32	02 39 E	Galway ———	53 10	04 49
St. David's Head	51 55	00 08 W	Slieve Head ———	53 20	06 01
Barfey Isle ———	52 46	00 16 E	Londonderry ———	54 55	02 46
Holy head ———	53 23	00 34 E	Belfast ———	54 36	01 36
Liverpool ———	53 20	02 16 E	The Coast of Holland and Flanders.		
Whitehaven ———	54 25	01 59 E	Scaw ———	53 26 N	15 24 E
Carlisle ———	54 45	02 49 E	Helighland ———	54 28 N	13 49 E
The Coast of Scotland.					
Glasgow ———	55 53 N	01 09 E			
N. Part of Sky Isle	57 50 N	00 07 W			

A Table of Latitude and Longitude.

Places Names.	Latitude N. or S.		Longit. E. or W.		Places Names.	Latitude N. or S.		Longit. E. or W.	
	D. M.		D. M.			D. M.		D. M.	
Hambrough	53	41	15	38	Cape Paul	37	58	04	52
Emden	53	05	13	14	Cape Martin	39	00	05	42
The Fly	53	18	10	49	Barcelona	41	30	07	35
The Texel	53	10	10	13	Marseilles	43	20	10	29
Amsterdam	52	21	10	05	Toulon	43	06	10	54
Rotterdam	51	55	09	35	Genoa	44	25	13	54
The Brill	51	56	09	24	Leghorn	43	18	15	43
Sluyce	51	19	09	04	Rome	41	51	17	42
Calice	50	57	07	14	Naples	41	05	19	42
The Coast of France and Portugal.					Cape Spartavento	38	00	25	12
Diep	49	56	04	08	Cape Collone	39	10	23	14
Cape de Hague	49	46	03	08	Gallipoli	40	08	23	53
Caskets	49	50	02	42	Cape St. Mary	39	56	24	14
Guernsey	49	36	02	34	Ancona	43	31	19	54
Morlaix	48	37	01	24	Venice	45	18	18	24
Ushant	48	30	00	09	Lepanto	38	20	27	09
Brest	48	23	00	50	Cape Matapan	36	35	27	34
Penmark	47	48	00	59	Cape St. Angelo	36	41	28	34
Bell Isle	47	20	02	04	Athens	38	00	29	43
Nantz	47	14	03	25	Cape Martelo S.	38	00	30	59
Island Dieu	46	40	02	59	P. of Negropont	38	00	30	59
Island Ree	46	13	03	44	Cape Monte Sancto	40	05	31	19
Rochel	46	10	04	00	Gallipoli	40	30	33	12
Bordeaux	44	50	04	50	Constantinople	41	07	35	14
Bilboa	43	30	02	14	Smyrna	38	30	32	41
Cape Ortegal	44	02	02	26W	Ephesus	37	54	32	29
Cape Finister	43	06	04	46W	Antiocheta	36	40	36	51
Port a Port	41	18	04	06W	Scandaroon	36	00	41	12
Burlings	39	39	05	01W	Tripoli	34	40	40	54
Rock of Lisbon	38	54	05	06W	Alexandria	31	07	36	04
Cape St. Vincent	37	00	04	18W	Cape Rufat	33	15	27	09
Cadiz	36	16	01	46W	Cape Misérato	32	43	21	37
Cape Trefalgar	36	10	01	16W	Tripoly	32	55	18	14
The Coast on the Main Continent within the Straits.					Cape Bona	37	05	15	14
Gibraltar	36	11N	00	29W	Bona	37	00	12	14
Cape de Gat	37	03N	03	12E	Algier	36	40	08	19
					Cape de tres forcas	35	34	03	49

A Table of Latitude and Longitude.

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Places Names.	Latitude North.	Longit E. or W.	Places Names.	Latitude N or S	Longit. E. or W
	D. M.	D. M.		D. M.	D. M.
Tetuan ———	35 28 N	00 38 W	Cape de Verde ———	14 30	11 12 W
Seuta ———	35 55 N	00 33 W	River Gambia ———	13 16	10 06 W
Tangier ———	35 55 N	01 00 W	Serralion ———	08 36	07 01 W
Islands within the Straits.			Monserado ———	06 05	04 06 W
Alboran ———	36 10	02 44	Cape Palmos ———	04 03	00 22 W
Formentaria ———	38 44	07 04	Jaque Jaque ———	04 16	02 44
Yvica ———	39 05	08 04	Affene ———	04 15	04 14
Minorca City ———	39 48	07 54	Cape 3 Points ———	04 15	05 59
Port Maon Minorca	39 42	09 26	River Volta ———	05 40	08 44
Gallitta ———	37 40	13 48	River Formosa ———	07 00	12 54
Sardinia South End	39 12	13 48	Cape Formosa ———	04 40	13 14
Corfica North End	42 57	14 59	New Callabar ———	04 12	15 39
Gorgona ———	43 34	14 52	Old Callabar ———	03 18	16 46
Capria ———	43 06	14 54	River Camerones	04 02	18 24
Lilboa ———	42 44	15 19	River de Angra ———	00 49	18 29
Messina ———	38 22	11 39	Lopas ———	01 05	17 34
Maritimo ———	38 12	17 09	River Congo ———	05 45	20 39
Cape Passero ———	36 48	21 18	Angola ———	08 51	21 10
Malta ———	36 15	19 49	Cape Negro ———	16 08	23 00
Corfu ———	39 45	25 56	Cape St. Thomas	23 10	19 37
Chefalonias ———	38 15	27 03	Secos ———	28 56	20 46
Zant ———	37 47	26 24	C. Bona Esperance	34 25	22 39
Moden or Morea	36 52	26 46	Western Islands.		
Lemnos ———	39 50	30 41	Corvo ———	40 05	24 41
Scio ———	38 20	29 09	Flores ———	39 40	24 36
C. St. John West	35 20	28 41	Fyal ———	38 53	22 02
end of Candy }			Pico ———	38 32	21 17
Cape Solomon, E. }	35 25	31 45	St. George ———	38 56	20 56
end of Candy - }			Tercera ———	38 53	19 28
Rhodes City ———	36 40	33 14	St. Michael ———	38 00	17 18
West end of Cyprus	35 21	36 49	St. Maries ———	37 00	17 03
East-end of Cyprus	35 35	39 39	The Canary Islands.		
The Coast of Barbary and Guinea.			Ferro ———	28 00	12 58
Cape Spartel ———	35 46	00 41	Palma ———	28 50	12 46
Sallee ———	33 43	01 16	Gomero ———	28 00	12 12
Cape Cantin ———	32 16	04 06	Teneriff ———	28 20	11 31
Cape de Geer ———	30 04	04 56	Madeira West end	32 17	12 08
Cape Bajador ———	26 12	09 16	Porto Sancto ———	32 50	10 36
Cape Olerado ———	23 41	10 36	Canaria ———	27 56	10 22
Cape Blanco ———	20 35	11 41	Fortaventura ———	27 54	08 10
Senegall ———	15 16	10 26	Lancerota ———	28 32	07 40

Cape

A Table of Latitude and Longitude.

Places Names.	Latitude N. or S.	Longit. E. or W	Places Names.	Latitude N. or S.	Longit. E. or W
Cape de Verde Islands.	D. M.	D. M.		D. M.	D. M.
St. Antonio	17 10	20 34	Dew Point	15 50	87 19
St. Vincent	16 55	20 24	Vifegapatam	17 40	90 21
St. Lucia	16 45	20 16	Cape Palmaris	20 45	93 24
St. Nicholas	16 40	19 36	Bengal	22 27	97 03
Brava	14 35	19 52	Cape Negrais	26 23	98 19
Fuogo	14 42	19 14	Cape Malacca	20 25	108 34
Jago	15 20	18 24	Siam Entrance	13 10	106 15
Isle of May	15 16	17 26	Cambodia Entrance	0 30	110 34
Isle of Sal	16 45	17 16	Cochin	18 25	109 12
Bonavista	16 05	17 09	Cantam	23 30	118 34
Southern Islands.			Amoy or Quemoy	4 35	122 09
St. Matthews	01 40 S	02 19 W	Lampo	30 10	125 39
Ascension	08 10 S	07 21 W	Nanquin	32 52	125 19
St. Helena	16 06 S	00 26 W	Islands in the East-Indies.		
Fernandepo	02 35 N	17 09 E	Madagascar } S end	26 06	51 34
Princeps	01 25 N	16 14 E	St Laurence } N end	12 10	55 24
St. Thomas	00 00	15 12 E	Mayetta	13 10	50 59
Annabona	01 42 S	14 02 E	Mohilla	12 15	48 55
The Coast on the Main Continent in the East Indies			Comero	11 50	48 59
Cape Lagulias	35 35 S	23 54	St. Juan de Nova	17 30	47 49
Cape Corientes	23 52 S	40 49	Mauritius	20 05	60 19
Mofambique	15 05 S	45 44	Digo Royes	19 45	66 49
River de Fugos	00 00	46 29	Romeras de Castela	29 05	72 10
Cape Bassos	04 00	55 04	Amsterdam [mos	39 50	79 38
Cape Guardafoy	11 50	57 44	St. Brandon	16 38	69 44
Cape Rosulgat	22 27	65 59	Digo Gratiofa	08 42	74 19
Cape Muca	26 56	62 24	Quabella	03 49	57 53
Buffera	30 00	54 19	Bassos de Chagos	05 05	75 39
Surrat	21 08	78 39	Yas de Digo Rays	00 00	77 19
Goa	15 22	79 51	Maldivia } N end	07 05	78 19
Calecute	11 17	80 03	Maldivia } S. end	01 00	81 29
Cochin	09 58	86 59	Malique	09 00	78 29
Cape Comerine	07 50	83 39	Sacatra	12 28	60 51
Fort St George	13 08	86 56	Abdeleur	12 10	59 37
			Cape Gallo de Zelone	06 07	85 59
			Yas		

A Table of Latitude and Longitude.

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Places Names.	Latitude N. or S.		Longit. E. or W.		Places Names.	Latitude N. or S.		Longit. West	
	D. M.		D. M.			D. M.		D. M.	
Yas de Amber —	00	00	N	57 44	Bay Bonaventuro	03	28	N	74 52
Andaman —	13	00		96 39	Island Gallopega	05	00		84 56
Nicobor —	07	05		98 09	Cape del Ajuga —	06	38		83 36
Sumatra NW. End	05	28		98 59	Lima —	12	30		68 16
Verkins Island —	02	22		99 21	Arica —	18	12		68 56
Nassau Island —	02	44		103 46	La Serena —	24	40		71 18
Bencola —	03	50		106 27	I. Juan Fernando	33	26		81 34
Sumatra SE. End	05	42		109 18	Baldivia —	32	35		76 06
Engauo —	05	40		106 07	Port Steven —	46	50		77 22
Selam —	08	20		107 27	Cape Victory —	52	15		78 06
Princes Island —	06	30		109 16	Cape Horn —	57	58		74 41
Bantam in Java —	05	47		110 25	The Coast of Brazile in South America, from Cape Horn to Cape Roque.				
Batavia —	05	37		117 41	Magellan E. entran	51	58		70 16
Java East End —	08	35		109 32	River Julian —	48	40		69 18
Straits of Sundy	05	52		111 51	Cape Blanco near }	46	50		66 51
Banca South End	03	25		118 09	R. Camarones }				
Borneo South Point	04	14		131 51	Buenos Aires R. Plata	36	10		52 16
Bandy Isles —	05	05		131 51	River Grand —	31	55		46 26
Celebes { South end	06	00		122 41	St. Katherine's —	28	00		42 36
{ N. end	01	40		126 44	Cape Frio —	23	10		37 42
Mindano West point	06	30		123 49	Spirito Sancto —	19	58		36 46
Borneo North Point	07	10		117 59	P. Segura —	16	22		35 44
Luconio { S. point.	12	30		126 04	Bay Todos Sanctus	13	00		35 21
{ NE. poi.	18	35		124 19	R. St. Francisco	10	55		32 32
Anain { W point	19	30		113 20	Cape St. Augustine	08	05		30 24
{ E. point	19	55		116 30	Cape Roque —	05	00		30 38
Formosa { S. point	22	00		124 44	Tristian de Cunha	37	05		10 24
{ N point	25	32		125 39	Trinidad —	20	30		24 46
Piscadore Isles —	23	30		122 49	The Coast of the Main Continent in the West-Indies.				
Islands Chusan —	30	38		125 49	R. Amazonas Entr.	00	00		43 40
Japan { S.E. point	39	50		140 29	North Cape —	02	05		44 41
{ S.W. point	39	10		132 00	Suranam —	06	00		51 41
The Coast of America in the South Sea, from Callifornia to Cape Horn.					Oronoque —	08	15		53 51
Cape St. Sebastian	42	30		124 41	C. Coquibaca —	12	50		65 26
Cape St. Lucia —	23	25		106 42	Carthagen —	10	50		70 36
Cape Corientes —	17	40		105 16	Scots Settlement	08	30		73 31
Aquapulco —	17	00		101 14	Nicarague Entrance	11	15		79 51
Aquatulco —	15	27		95 49	Cape Catocha —	21	12		83 41
Guatimala —	14	25		99 46					
Panama —	08	56		77 04					

A Table of Latitude and Longitude.

Places Names.	Latitude North.	Longit. E. or W.	Places Names.	Latitude North.	Longit. West.
	D. M.	D. M.		D. M.	D. M.
Campeche ———	19 20 N	87 51 W	Bahama Island ———	27 05	73 44
La Vera Cruz ———	19 15 N	95 11 W	Abacco S. Point ———	25 30	72 06
Escondido ———	30 20 N	84 16 W	Harbour Island ———	25 40	71 21
Cape Florida ———	24 48 N	76 41 W	Andros N. Point ———	25 15	73 46
The Caribbee Islands.			Providence ———	25 00	72 31
Trinidad ———	10 05	54 51	Illathera S. point ———	24 30	70 48
Tobago ———	11 10	54 06	Cat Island ———	24 25	70 06
Granado ———	12 07	55 16	Watling Island ———	24 07	69 36
Barbadoes ———	13 10	52 49	Rum Key ———	23 45	69 51
St. Vincent ———	13 12	54 08	Exuma ———	23 25	70 43
St. Lucia ———	13 52	54 03	Crooked Isle N. point ———	23 03	68 46
Martinico ———	14 48	53 11	Atkins Key ———	22 30	69 01
Dominico ———	15 35	53 13	Meraparovuz ———	21 57	69 26
Marigallante ———	15 53	53 06	Atwood Keys ———	23 09	68 16
Guardalupa ———	16 15	54 09	French Keys ———	22 40	68 21
Monferat ———	16 40	54 21	Mayaguana ———	22 35	67 46
Antegoa ———	17 00	54 07	Hogsties ———	21 15	68 36
Nevis ———	17 06	55 04	Hyncago ———	20 57	68 06
St. Christophers	17 22	55 21	Cankcofs Bank	20 50	66 01
Barbuda ———	17 43	54 11	N. point ———		
St. Bartholomew	17 54	55 31	Turks Island ———	21 35	64 54
St. Martins ———	18 05	55 25	Abrollo N. point ———	21 40	63 26
Anguilla ———	18 13	55 41	Platewrack ———	20 03	62 56
Virgins ———	18 23	57 08	The Coast of Carolina, Virginia, Maryland, Pennsylvania, New-England, and New-foundland.		
St. Cruz ———	17 38	57 21			
Bieque ———	18 00	58 01			
Porto Rico St. Johns	18 33	59 06			
St. Domingo Hispan.	18 15	63 36			
P. Royal Jamaica	18 00	71 49	Charles Town	32 40	73 36
East End of Cuba	20 20	68 51	upon Ashly River		
Havana ———	22 50	78 16	Cape Hatteras ———	35 10	69 11
Bay Hondy ———	22 35	79 26	Cape Henry ———	37 00	69 16
Cape St. Antonia	21 50	81 18	Cape Charles ———	37 14	69 01
Bahama Islands.			Cape Hinlopen ———	39 04	68 11
Bermudas ———	32 30 N	56 16 W	Long Island ———	40 05	65 26
N. Point ———	28 22 N	73 01 W	New York ———	41 00	66 51
Bahama Bank					Cape

A Table of Latitude and Longitude.

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Places Names.	Latitude North		Longit. West		Places Nams.	Latitude N. or S		Longit. E. or W					
	D. M.		D. M.			D. M.		D. M.					
Cape Cod	42	10	62	31	The Coast of Iceland, Greenland, Nova Zembla, and the Northern Isles.								
Boston	42	35	63	36									
Cape Sable	43	45	58	11									
Island Sable	44	30	53	51									
Cape Britain	46	20	53	06									
Quebeck	47	05	64	36	Sound Royal	66	22	19	29				
Bay of Brest	52	10	49	46	Bargazer Point	66	30	16	26				
Bell Island	52	05	48	56	Whales Back	65	27	15	19				
Cape St. John	50	09	47	21	Merchants Foreland	63	20	19	19				
Cape Bonavista	49	11	46	49	Halliford	64	30	29	29				
Trinity Bay	48	27	49	41	Fair Foreland	65	10	31	59				
Conception Bay	47	53	48	56	Grims Island	66	51	22	59				
St. John's Harbour	47	28	48	41	Westmania Isles	63	51	23	24				
Bay of Bulls	47	40	49	32	Isles of Fero	62	06	00	14				
Cape Race	46	30	48	11	Beerenberg, or	North Latitude.	West Longitude.	East Longitude.					
Cape St. Mary	47	10	48	06	John Mains Isle					71	45	09	44
Placentia	47	57	49	46	Point Lookout					76	40	21	39
Cape Roy	48	21	52	01	Horn Sound					77	23	19	34
					Fair Foreland					79	18	16	04
The Coast of Hudson's Bay, and the Straits.					Hacluits Headland	79	55	17	14				
					Helies Sound	79	15	17	19				
Buttons Isles	60	05	64	36	Lees Foreland	78	05	28	39				
Cape Charles	62	35	70	06	Whales Head	77	18	26	44				
Cape Walsingham	63	05	72	26	Hope Island	76	22	27	14				
Mansfield Isle	62	20	70	16	Cherry or Bear Isle	74	35	23	19				
Cape Jones	55	03	73	01	Admiralty Island	75	05	65	04				
Ruperts River	51	16	73	41	Fretum Borough	69	55	67	19				
Albany River	52	32	77	51	Cape Candense	69	17	47	44				
The Cubbs	54	18	77	36	Catnose	65	43	40	28				
C. Henrietta Maria	55	06	77	48	Archangel Bar	65	05	40	44				
Port Nelson	57	05	87	36	Cross Island	66	31	41	47				
Cape Churchil	59	00	87	43	Sweetnose	68	08	39	56				
C. Southampton	61	57	83	16	Kilduyn	69	32	35	29				
Shark Point	64	27	78	06	North Cape	71	25	27	14				
Nottingham Isle	63	38	74	32	Surroy	71	05	21	54				
Q. Ann's Foreland	63	32	69	37	Tromsund	70	18	21	14				
Resolution Isle	61	55	59	36	Loefort SW. Point	67	47	14	49				
Cape Farewell	59	10	41	31	Dronton	64	00	15	54				
					Stadland	62	10	09	52				
					North-bergen	60	16	10	54				
					Naze of Norway	57	50	12	36				

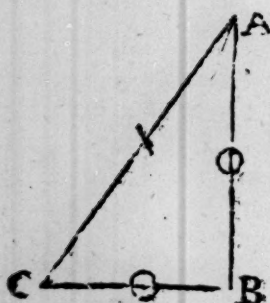
Places Names.	Latitude North.		Longit. East.		Places Names.	Latitude North.		Longit. East.	
Sea-Coast in the Sound, and Baltick Sea.	D. M.		D. M.			D. M.		D. M.	
Mardau ———	58	25	14	19	Revel ———	59	00	29	59
Larwick ———	58	54	14	34	Riga ———	56	50	30	04
Christiana ———	59	10	14	59	Derwinda ———	57	20	27	14
Mæsterland ———	57	58	16	59	Coningsberg ———	55	00	25	44
Gottenberg ———	57	33	17	39	Dantzick ———	54	22	24	14
Elfsinor ———	56	00	17	46	Wisby in Gotland ———	57	37	24	04
Copenhagen ———	55	44	17	49	Bornholm ———	55	27	20	07
Valsterborn ———	55	20	18	09	Straelfound ———	54	45	18	34
Kalmer ———	56	40	21	54	Lubeck ———	54	25	16	19
Stockholm ———	59	20	23	39	Anout ———	56	42	16	12
Wyborg ———	60	20	34	40	Lefou ———	57	05	15	54
Petersburg ———	59	25	35	04	Scaw ———	57	26	15	24
Narve ———	58	39	33	28					

Problems of Plain Sailing, wrought by the Logarithms, and by Gunter's Scale.

P R O B L E M I.

THE Course and Distance being given; to find the Difference of Latitude and Departure.

Example. Suppose a Ship sails South West by South 382 Minutes, and it be required to find the Difference of Latitude and Departure.



In the Triangle ABC.

AC represents the Distance sailed.

AB the Difference of Latitude.

BC the Departure.

BAC (or the Angle at A) the Angle of the Course.

ACB (or the Angle at C) the Complement of the Course to 90 deg.

Characters

Characters used in Navigation and Astronomy.

S. stands for Sine.

T. for Tangent.

Sc. Sine Complement. Tc. Tangent Complement.

The given Sides and Angles of a Triangle are mark'd with a Dash thus (').
The required Sides and Angles with a Cypher thus (°).

The Operation by the Logarithms. For the Difference of Latitude.

As Radius	_____	_____	_____	_____	10.000000
To the Distance failed 382 Minutes	_____	_____	_____	_____	2.582063
So is Sc. of the Course 56d. 15 m.	_____	_____	_____	_____	9.919846
To the Difference of Latitude 317 Minutes $\frac{5}{8}$	_____	_____	_____	_____	12.501909

For the Departure.

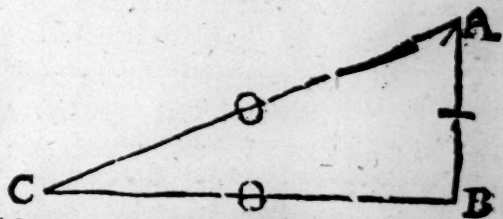
As Radius	_____	_____	_____	_____	10.000000
To the Distance failed 382 Minutes	_____	_____	_____	_____	2.582063
So is the S. of the Course 33d. 45 m.	_____	_____	_____	_____	9.744739
To the Departure 212 Minutes $\frac{2}{8}$	_____	_____	_____	_____	12.326802

The Operation by Gunter's Scale.

One Foot of the Compasses being in the Radius, or S. of 8 Points; extend the other to the Distance 382 Minutes, the said Extent laid from S. Course 3 Points will reach to 212 Minutes the Departure from the Meridian, and the Compasses kept at the same Distance will reach from the Sc. Course 5 Points to 317 Minutes, the Difference of Latitude as above.

P R O B. II. The Course and Difference of Latitude given, to find the Distance and Departure.

Suppose a Ship sails W.S.W. until the Difference of Latitude be 219 Leagues, and the Distance and Departure required.



The Operation by the Logarithms. For the Distance.

As the Sc. of the Course 22d. 30 m.	_____	_____	_____	9.582840
To the Difference of Latitude 219 Leagues	_____	_____	_____	2.340444
So is Radius	_____	_____	_____	10.000000
To the Distance, which is 572 $\frac{2}{8}$ Leagues	_____	_____	_____	2.757604

For

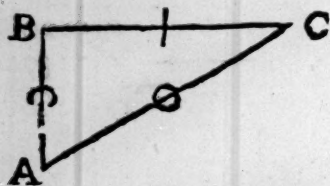
For the Departure.

Rs Radius	_____	_____	_____	10.000000
To the Distance $572\frac{1}{2}$ Leagues found before	_____	_____	_____	2.757604
So is the Sine of the Course 67 deg. 30 min.	_____	_____	_____	9.965615
To the Departure $528\frac{1}{2}$ Leagues	_____	_____	_____	12.723219

By the Gunter.

The Compasses being extended from the S. of 2 Points, the Complement of the Course to 219 Leagues, the Difference of Latitude, will reach from Radius S. 8 Points, to 572 Leagues the Distance, and the same Extent of the Compasses from the Sine of the Course 6 Points, shall reach to 529 Leagues, the Departure.

P R O B. III. The Course and Departure given, to find the Distance and Difference of Latitude.



Suppose a Ship sails North East by East, until her Departure be 220 Minutes, the Distance and Difference of Latitude required.

By the Logarithms. For the Distance.

As the S. of the Course 56d. 15m.	_____	_____	_____	9.919846
To the Departure 220 Minutes	_____	_____	_____	2.342423
So is Radius	_____	_____	_____	10.000000
To the Distance 265 Minutes	_____	_____	_____	12.422577

For the Difference of Latitude.

As Radius	_____	_____	_____	10.000000
To the Distance 265 Minutes	_____	_____	_____	2.423246
So is the Sc. of the Course 33 deg. 45 min.	_____	_____	_____	9.744739
To the Difference of Latitude 147 Minutes	_____	_____	_____	12.167985

By the Gunter.

The Extent of the Compasses from the S. of the Course 5 Points, to the Departure 220 Minutes, will reach from Radius S. of 8 Points, to 265 the Distance, and the same Extent of the Compasses from S. 3 Points the Complement of the Course, shall reach to the Difference of Latitude 147 Minutes as above.

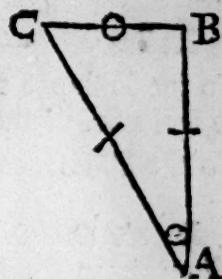
P R O B. IV. The Distance and Difference of Latitude given, to find the Course and Departure.

Sup.

Plain Sailing.

79

Suppose a Ship sails between the North and the West 206 Miles, until the Difference of Latitude be 197 Miles, the Course and Departure required.



By the Logarithms. For the Course.

As the Distance 206 Miles	_____	_____	_____	2.313867
To the Radius	_____	_____	_____	10.000000
So is the Difference of Latitude, 197 Miles	_____	_____	_____	2.294466
To the Sc. of the Course ; which is N. 17d. 00m. West	_____	_____	_____	9.980599

For the Departure.

As Radius	_____	_____	_____	10.000000
To the Distance 206 Miles	_____	_____	_____	2.313867
So is the S. of the Course 17 deg. 00 min.	_____	_____	_____	9.465935
To the Departure 60 Miles	_____	_____	_____	11.779802

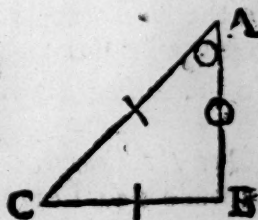
By the Gunter.

For the Course. The Extent from the Distance 206 Miles, to the Difference of Latitude 197 Miles, shall reach from Radius S. 90 deg. to the Sine of 73 deg. 00 min. the Complement of the Course, which subtracted from 90d. is 17m. 00min. the Course N. Westerly, or N. by W. half W.

For the Departure. The Extent from Radius S. 90 deg. to the Sine of the Course 17 deg. 00 min. shall reach from the Distance 206 Miles to the Departure 60 Miles as above.

P R O B. V. The Distance and Departure given, to find the Course and Difference of Latitude.

Suppose a Ship sails between the South and the West 247 Minutes, until the Departure be 197 Minutes, and it be required to find the Course and Difference of Latitude.



The Operation by the Logarithms. For the Course.

As the Distance 247 Minutes	_____	_____	_____	2.392697
To the Radius	_____	_____	_____	10.000000
So is the Departure 197 Minutes	_____	_____	_____	2.294466
To the Sine of the Course 52 deg. 54 min. Westerly	_____	_____	_____	9.901769

For

Plain Sailing.

For the Difference of Latitude.

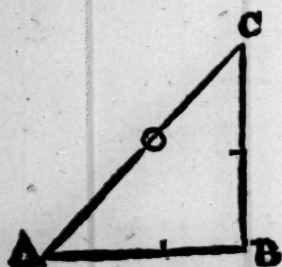
As Radius	_____	_____	10.000000
To the Distance 247 Minutes	_____	_____	2.392697
So is the Sc. of the Course 37 deg. 06 min.	_____	_____	9.780467
To the Difference of Latitude 149 min.	_____	_____	12.173164

By the Gunter.

For the Course. The Extent of the Compasses from the Distance 247 Minutes, to the Departure 197 Minutes, shall reach the same way from Radius S. 90 deg. to the Sine of the Course, 52 deg. 54 min. South Westerly, or South West three quarters West.

For the Difference of Latitude. The Extent from Radius S. 90 deg. to the S. 37 deg. 06 min. the Complement of the Course, will reach the same way from the Distance 247 min. to the Difference of Latitude, 149 min.

P R O B. VI. The Difference of Latitude and Departure given, to find the Course and Distance.



Suppose a Ship sails between the South and West until the Difference of Latitude be 154 Leagues, her Departure 200 Leagues, and it be required to find the Course and Distance.

The Operation by the Logarithms. For the Course.

As the Difference of Latitude 154 Leagues	_____	2.187521
To Radius	_____	10.000000
So is the Departure 200 Leagues	_____	2.301030
To the Tang. of the Course 52 deg. 24 min. South Westerly	_____	10.113509

For the Distance.

As the Sc. of the Course 37 deg. 36 min.	_____	9.785433
To the Difference of Latitude 154 Leagues	_____	2.187521
So is the Radius	_____	10.000000
To the Distance 252 Leagues	_____	2.402088

By the Gunter

For the Course. The Extent of the Compasses from the Difference of Latitude 154 Leagues, to the Departure 200 Leagues, shall reach from Radius or Tangent of 45 deg. to the Tang. of the Course, 52 deg. 24 min. South Westerly, or South West $\frac{3}{4}$ West.

For the Distance. The Extent from the S. 37 deg. 36 min. the Complement of the Course, To Radius, or the S. of 90 deg. will reach from the Difference of Latitude 154 Leagues, to the Distance 252 Leagues.

P R O B.

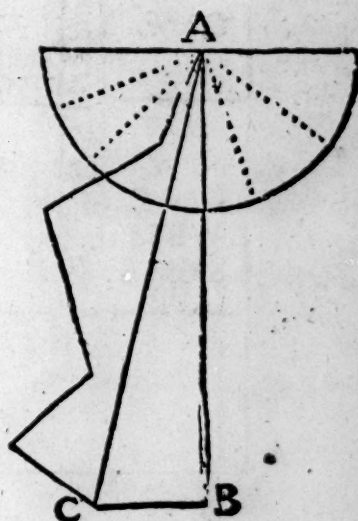
P R O B. VII.

This Problem shews the manner of working a Traverse, and is very useful in keeping a Reckoning by Plain Sailing.

Example.

Suppose a Ship bound to a certain Port, and she sails first *SSW*. 40 minutes, then *SW*. 60 min. then *S by E*. 63 min. *WSW*. 49 min. then *SE*. by *S*. 56 min. and the Difference of Latitude and Departure the Ship hath made, with the direct Course and Distance is required.

The Operation by the Logarithms.



For the Difference of Latitude for the first Course.

As Radius	_____	_____	_____	_____	10.000000
To the Distance 40 min.	_____	_____	_____	_____	1.602060
So is the S.c. of the Course $22^{\circ} 30'$	_____	_____	_____	_____	9.965615
To the Difference of Latitude, 36 min. $\frac{1}{8}$	_____	_____	_____	_____	11.567675

For the Departure of the first Course.

As Radius	_____	_____	_____	_____	10.000000
To the Distance 40 min.	_____	_____	_____	_____	1.602060
So is the S. of the Course $22^{\circ} 30'$	_____	_____	_____	_____	9.582839
To the Departure 15 min. $\frac{3}{8}$	_____	_____	_____	_____	11.184899

By the Gunter.

The Extent of the Compasses from Radius the S. of 8 Points, to the Distance 40 min. that Extent in the Compasses laid from the Sine of the Course 2 Points will reach to 15 min. $\frac{3}{8}$ the Departure, and the Compasses being kept to the same Extent, and laid from the S. 6 Points, the Complement of the Course will reach to 36 min. $\frac{9}{8}$ the Difference of Latitude.

In the same manner proceed to find the Difference of Latitude and Departure for each Course and Distance; which being found, place in a Table as follows.

L

The

Plain Sailing.
The Traverse Table.

<i>Course.</i>	<i>Distances.</i>	<i>North.</i>	<i>South.</i>	<i>East.</i>	<i>West.</i>
SSW	40		37.0		15.3
SW	60		42.4		42.4
S by E	63		61.8	12.3	
WSW	49		18.8		43.3
SE by S	56		46.6	31.1	
		<i>Diff. Lat.</i>	206.6	43.4	130.0
					43.4
				<i>Dep.</i>	59.6

The Explanation of the Table.

For the placing the Difference of Latitude and Departure in their proper Columns, observe, that if the Course be Northerly the Difference of Latitude is put in the North Column; if it be Southerly in the South Column; and if the Course be Easterly, the Departure is put in the East-Column; if Westerly in the West Column.

Thus having framed the Table, add up the North, South, East, and West Columns severally, whereby the Difference of Latitude appears to be 206 $\frac{6}{10}$ Minutes South, because there is nothing in the North Column: The Departure 59 $\frac{6}{10}$ Minutes West, because so much the West Column exceeds the East: By which Difference of Latitude and Departure, find the direct Course and Distance as follows.

The Operation by the Logarithms. For the direct Course.

As the Difference of Latitude 206 min. $\frac{6}{10}$ 2.315130
 To the Radius 10.000000
 So is the Departure 59 min. $\frac{6}{10}$ -1.775246
 To the T. of the Course 16° 5' South Westerly, because }
 the South and West Columns exceed the North and East. } 9.460116

For the Distance.

As the Sc. of the Course 16d. 5m. -9.982660
 To the Difference of Latitude 206 min. $\frac{6}{10}$ -2.315130
 So is Radius 10.000000
 To the Distance required 215 Minutes 2.332470
By

By the Gunter. For the direct Course.

The Extent of the Compasses from the Difference of Latitude 206 min. to the Departure 59 min. shall reach from the Tangent of 45d. (or Radius) to the Tangent of 16d. 5m. the Course required.

For the Distance.

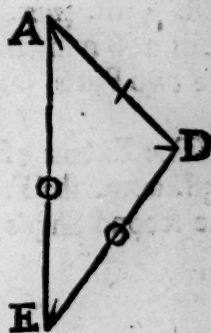
The Extent from S. 73 deg. 55 min. the Complement of the Course, to S. 90 deg. viz. Radius, shall reach from the Difference of Latitude 206 min. to the Distance 215 Minutes.

Oblique-angled Plain Triangles, applied in PROBLEMS of Plain Sailing, and wrought by the Logarithms, and Gunter's Scale.

PROB. I. **T**HE Angles and one of the Sides given, to find either of the other Sides.

Example.

Suppose there are two Ports both under one Meridian, a Ship sails from the Northermost SE. 206 Miles, another Ship sails from the Southermost North East by North, a certain Number of Miles, and meets with the first Ship; the Distance between these two Ports, and the Distance sailed by the second Ship is required.



In the Triangle ADE.

A and E represents the two Ports, AD the first Ship's Distance. ED the second Ship's Distance. AE the Distance between the two Ports.

The Operation by the Logarithms. For the Distance between the two Ports.

As S. AED 33d. 45m. ————— Co. Ar. 0.255261
 To AD the first Ship's Distance 206 min. ————— 2.313867
 So is S. ADE 105d. 15m. which subtract from 180 deg. ————— 9.991573
 To AE the Distance between the two Ports 364 min. ————— 12.560701

In all Operations where Radius is not one of the three given Terms, to save the Labour of subtracting the first Logarithm from the Sum of the second and third, use the Complement Arithmetical of the first Logarithm

rithm, which is found by subtracting each Figure of the Logarithm from 9, except the first towards the Right-hand, which is subtracted from 10, as in the Operation, the Logarithm Sine found in the Table is 9.744739, wherefore beginning at the Left-hand, say, 9 from 9 there remains 0 ; 7 from 9 there remains 2 ; 4 from 9, there remains 5 ; 4 from 9 there remains 5 ; 7 from 9 there remains 2 ; 3 from 9 there remains 6 ; 9 from 10, there remains 1. So the Complement Arithmetical of the first Logarithm, is 0.255261, which added to the other two Logarithms, and from the Sum abate Radius, the Remainder is the Logarithm, Sine, or Tangent required.

And *Note*, to find the Sine of any Degree and Minute above 90d. subtract the Degree and Minute from 180d. the Sine of the Remainder is the Sine required.

For the second Ship's Distance.

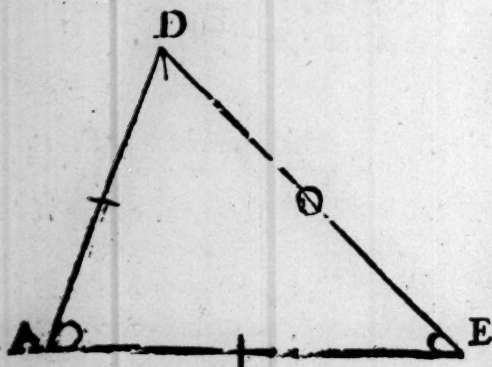
As S. AED 33d. 45m.	_____	_____	_____	Co. Ar. 0.255261
To AD the first Ship's Distance 206 min.	_____	_____	_____	2.313867
So is S. DAE 45d. 00m.	_____	_____	_____	9.849485
To DE the second Ship's Distance, 262 min.	_____	_____	_____	12.418613

By the Gunter. For the Distance between the two Ports.

The Extent of the Compasses from S. of 33 deg. 45 min. to the S. ADE 78d. 45m. (*viz.* the Complement of 101d. 15m. to 180d.) shall reach from 206 min. the first Ship's Distance, to 364 min. the Distance between the two Ports, as above.

For the second Ship's Distance.

The Extent of the Compasses from the S. of 33d. 45m. to the S. of 45d. 00m. shall reach from 206 min. the first Ship's Distance, to 262 min. the second Ship's Distance required.



P R O B. II.

Two Sides and an Angle opposite to one of them being given, to find the other opposite Angle and the third Side.

Example.

Suppose two Ports, whose Bearing is North East and South West, distant 396 Miles, a Ship at the northermost fails South South East, and another Ship at the southermost fails thence 518 Miles, and meets with the first Ship: The Course sailed by the second Ship, and the first Ship's Distance are required.

In

Oblique Plain Sailing.

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In the Triangle ADE.

A represents the Southermost Port, D the Northermost.

AD the Distance between the two Ports.

DE the Course and Distance sailed by the first Ship.

AE the Course and Distance sailed by the second Ship.

The Operation by the Logarithms. For the second Ship's Course.

As AE the second Ship's Distance 518 min. ——— Co. Ar. 7.285671
 T. S. ADE 67d. 30m. ——— 9.965615
 So is AD the Distance between the two Ports 396 min. ——— 2.597695
 To S. AED 44 deg. 56 min. ——— 19.848981

The Angle at D 67d. 30m. and the Angle at E 44d. 56m. being added together and subtracted from 180d. gives 67d. 34m. the Angle at A, which makes nearest 6 Points, and 6 Points reckon'd from the North East to the Southwards gives ESE. the second Ship's Course required.

For the first Ship's Distance.

As S. ADE 67d. 30min. ——— Co. Ar. 0.034385
 To AE the second Ship's Distance 518 min. ——— 2.714329
 So is DAE 67 deg. 34 min. ——— 9.965824
 To DE the first Ship's Distance 518 min. ——— 12.714538

By the Gunter. For the second Ship's Course.

The Extent of the Compasses from 518 min. to 67d. 30m. shall reach from 396 min. to S. 47 deg. 56 min. which added to the Angle at D, and the Sum subtracted from 180d. gives 67d. 30m. the Angle at A, as above.

For the first Ship's Distance. The Extent from S. 67d. 30m. to 518m. will reach from S. 67d. 34 min. to 518 min. the Ship's Distance as above.

P R O B. III.

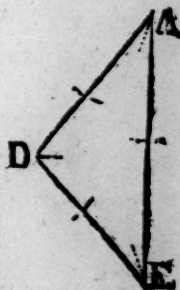
Two Sides and the contained Angle given, to find the other Angle.

Example.

Suppose two Ships sail from one Port ; one sails N. E. 140 Miles, the other South East by East 115 Miles, the Bearing and Distance of these two Ships is required.

Let D represent the Port, DA the first Ship's Distance, and DE the second.

Miles
 140
 115
 ———
 255
 Diff. 25



The

The Operation by the Logarithms. For the Bearing of the two Ships.

As the Sum of the sides AD and DE 255 min. — Co. Ar. 7.593459
 To the Difference of the said sides 25 min. — 1.397940
 So is the T. of half the Sum of their opposite Angles $50^{\circ} 37'$ 10.085698
 To the T. of half their Difference, which is 6d. 48m. — 19.077097

The half Difference added to the half Sum, gives 57d. 25m. the greater Angle AED. The half Difference subtracted from it, gives 43d. 49m. the lesser Angle DAE. Wherefore the Bearing of the two Ships is N. Easterly or South Westerly 1d. 11m.

For the Distance of the two Ships.

As S. AED 57 deg. 25 min. — Co. Ar. 0.074373
 To AD the first Ship's Distance 140 min. — 2.146128
 So is S. ADE 78 deg. 45 min. — 9.991573
 To AE the Distance of the Ships, 163 min. — 12.212074

By the Gunter. For the Bearing of the Ships

The Extent of the Compasses from the Sum of the sides 255m. to their Difference 25 min. shall reach from the T. of the half Sum of the required Angles $50^{\circ} 37'$ to the T. of half the Difference of the said Angles $6^{\circ} 48'$.

In the foregoing Operation by the Gunter, the Practitioner may be at a Loss, because in extending the Compasses from the T. $50^{\circ} 37'$ decreasing, it will fall beyond the T. of 45d. at the End of the Line. To remedy this, place the Extent from 255 to 25, from the T. 45d. and it will reach to the T. of 5d. 37m. then letting one Point stand at 5d. 37m. extend the other to the T. of 50d. 37m. this Extent place from the T. of 45d. shall fall on the T. 6d. 48m. required.

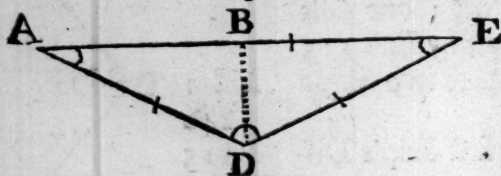
For the Distance of the Ships.

The Extent from the Sine of 57d. 25m. to the Sine of 78d. 45m. shall reach from 140 min. to 163 min.

P R O B. IV. Three Sides being given, to find an Angle.

Example. Suppose there are two Ports both in one Latitude, distant 536 Miles, a Ship sails from the Eastermost 306 Miles between the South and the West: Another Ship sails from the Westermost 290 Miles, and meets with the first Ship. The Course that each Ship hath steer'd is requir'd.

Let A and E represent the two Ports, D the place where the Ships meet.



This Question is resolved by letting fall a Perpendicular DB, reducing the Oblique Triangle ADE, into the two Right-angled Triangles ABD and BDE, then the Operation is as follows,

First, find the Segment of the Base BE, thus.

As the Base AE, 536 Miles — Co. Ar. 7.270835
 To the Sum of the Sides AD and ED 596 Miles — 2.775246
 So is the Difference of the said sides 16 Miles — 1.204120
 To a Segment of the Base, which is 18 Miles — 11.250201

The

Oblique Plain Sailing.

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The whole Base _____ 536 min.
 The Difference of the Segment is _____ 18
 Sum is _____ 554
 Half Sum _____ 277 the greater Segment BE.

Then say, *For the first Ship's Course.*

As DE the first Ship's Distance 306 min. _____ 2.485721
 To Radius _____ 10.000000
 So is the greater Segment BE 277 min. _____ 2.442479
 To Sc. BED 25d. 9m. _____ 9.956758

The Angle at E is the Course from the West Southerly, so the first Ship steers South 64° 51' West, or SW. by W. three quarters W. almost.

For the second Ship's Course.

As AD the second Ship's Distance 290 min. _____ Cc. Ar. 7.537602
 To Sine AED 25d. 9m. _____ 9.628378
 So, is DE the first Ship's Distance 306 _____ 2.485721
 To Sine DAE 26d. 39m. _____ 9.651701

The Angle at A is the Course from the East Southerly, so the second Ship steers South 63 deg. 21 min. East, or S E by E. $\frac{3}{4}$ E. nearly.

By the Gunter. For the Difference of Segments of the Base.

The Extent of the Compasses from the Base AE 536 min. to the Sum of the Sides 596 min. shall reach from the Difference of the Sides 16, to the Difference of Segments of the Base 18 min. with which proceed as before.

For the first Ship's Course.

The Extent from the Distance 306 min. to the greater Segment 277 min. shall reach from Radius or Sine 90d. to Sine 64 deg. 51 min. the Complement of BED 25 deg. 9 min. required.

For the second Ship's Course.

The Extent from 290 min. the second Ship's Distance, to 306 min. the first Ship's Distance, shall reach from the Sine 25 deg. 9 min. to the Sine 26 deg. 39 min. the Angle at A required.

P R O B. V.

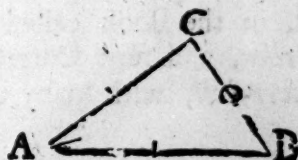
Two Sides and their contained Angle given, to find the third Side.

Example.

Two Ships sail from one Port at A; the first sails East 335 Miles to B, the second sails E. 14 deg. 40 min. North, 271 Miles to C. I demand how far they are asunder, and what is the Course from the Ship at C, to that at B.

In the Triangle ABC,
 there is given,

AB 335
 AC 271
 BAC 14° 40' } BC required.



This

This Case requires a double Operation

1. By the 3d Case to find the Angles
2. By the 1st Case to find the Side required.

AC	335
AL	271
Sum is	606
Diff is	64

The first Operation.

As the Sum of the Sides AB and AC 606 Miles — Co. Ar. 7.217528
 To their Difference — 64 — 1.806180
 So is the t. of half Sum of the Angles — $82^{\circ} 40'$ — 10.890440
 To t. half their Difference — 39 22 — 19.914148
 By which you will find the Angle ABC, to be 43 deg. 18 min.

The second Operation.

As S. ABC 43d. 18m. — Co. Ar. 0.163791
 To the Side AC 271 Miles — 2.432969
 So is S. BAC 14 deg. 40 min. — 9.403455
 To Side BC 100 Miles — 12.000215

The Angle at B is found to be 43 deg. 18 min. therefore the Line AB being East and West, the Course from C to B is East 43 deg. 18 min. S. or S. E. 1 deg. 42 min. Easterly. And the Distance 100 Miles.

By the Gunter, for the Angle at B.

The Extent from 606 Miles the Sum of the Sides, to 64 Miles the Difference of the sides, will reach from the Tang. of 82d. 40m. half the Sum of the unknown Angles; to the Tang. of 39 deg. 22 min. half their Difference, which being found, proceed as above to find the Angle at B.

Then the Extent from S. 43d. 18m. the Angle at B, to S. 14d. 40m. the Angle at A; will reach from 271 Miles the side AC, to 100 Miles the side BC, as above.

Thus much for Sailing by the *Plain Chart*; which being of some Use in short Voyages, and a good Foundation for further Improvement, we were not willing wholly to omit it; but nevertheless would advise all that take Charge of Ships never to content themselves with the Use of the *Plain Chart* only; being so apparently false in it self, and so unsafe for Practice: Nor are we under any Necessity to trust to it, the Defect thereof being now sufficiently supplied by Mr. *Wright's* True Chart, commonly called *Mercator's*, the Projection and Use of which (both in single Questions and Traverses) is largely treated of and rendered as easy as the *Plain Chart*, in the Book called *Practical Navigation*, first set forth by Mr. *John Seller*, and now Corrected and Reprinted for Mr. *Mount* and Page on *Tower-hill*, with many useful Additions.



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A Table of DIFFERENCE

Diff. 1	1 Deg.		2 Deg.		$\frac{1}{4}$ Point		3 Deg.		4 Deg.		5 Deg.		Diff. 1
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.1	01.0	00.1	01.0	00.1	1
2	02.0	00.0	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.2	2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3	3
4	04.0	00.1	04.0	00.1	04.0	00.2	04.0	00.2	04.0	00.3	04.0	00.3	4
5	05.0	00.1	05.0	00.2	05.0	00.2	05.0	00.3	05.0	00.3	05.0	00.4	5
6	06.0	00.1	06.0	00.2	06.0	00.3	06.0	00.3	06.0	00.4	06.0	00.5	6
7	07.0	00.1	07.0	00.2	07.0	00.3	07.0	00.4	07.0	00.5	07.0	00.6	7
8	08.0	00.1	08.0	00.3	08.0	00.4	08.0	00.4	08.0	00.6	08.0	00.7	8
9	09.0	00.2	09.0	00.3	09.0	00.4	09.0	00.5	09.0	00.6	09.0	00.8	9
10	10.0	00.2	10.0	00.4	10.0	00.5	10.0	00.5	10.0	00.7	10.0	00.9	10
11	11.0	00.2	11.0	00.4	11.0	00.5	11.0	00.6	11.0	00.8	11.0	01.0	11
12	12.0	00.2	12.0	00.4	12.0	00.6	12.0	00.6	12.0	00.8	12.0	01.0	12
13	13.0	00.2	13.0	00.5	13.0	00.6	13.0	00.7	13.0	00.9	12.9	01.1	13
14	14.0	00.2	14.0	00.5	14.0	00.7	14.0	00.7	14.0	01.0	13.9	01.2	14
15	15.0	00.3	15.0	00.5	15.0	00.7	15.0	00.8	15.0	01.0	14.9	01.3	15
16	16.0	00.3	16.0	00.6	16.0	00.8	16.0	00.8	16.0	01.1	15.9	01.4	16
17	17.0	00.3	17.0	00.6	17.0	00.8	17.0	00.9	17.0	01.2	16.9	01.5	17
18	18.0	00.3	18.0	00.6	18.0	00.9	18.0	00.9	18.0	01.3	17.9	01.6	18
19	19.0	00.3	19.0	00.7	19.0	00.9	19.0	01.0	19.0	01.3	18.9	01.7	19
20	20.0	00.4	20.0	00.7	20.0	01.0	20.0	01.0	20.0	01.4	19.9	01.7	20
21	21.0	00.4	21.0	00.7	21.0	01.0	21.0	01.1	20.9	01.5	20.9	01.8	21
22	22.0	00.4	22.0	00.8	22.0	01.1	22.0	01.1	21.9	01.5	21.9	01.9	22
23	23.0	00.4	23.0	00.8	23.0	01.1	23.0	01.2	22.9	01.6	22.9	02.0	23
24	24.0	00.4	24.0	00.8	24.0	01.2	24.0	01.3	23.9	01.7	23.9	02.1	24
25	25.0	00.4	25.0	00.9	25.0	01.2	25.0	01.3	24.9	01.7	24.9	02.2	25
26	26.0	00.5	26.0	00.9	26.0	01.3	26.0	01.4	25.9	01.8	25.9	02.3	26
27	27.0	00.5	27.0	00.9	27.0	01.3	27.0	01.4	26.9	01.9	26.9	02.4	27
28	28.0	00.5	28.0	01.0	28.0	01.4	28.0	01.5	27.9	02.0	27.9	02.4	28
29	29.0	00.5	29.0	01.0	29.0	01.4	29.0	01.5	28.9	02.0	28.9	02.5	29
30	30.0	00.5	30.0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02.6	30
31	31.0	00.5	31.0	01.1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7	31
32	32.0	00.6	32.0	01.1	32.0	01.6	32.0	01.7	31.9	02.2	31.9	02.8	32
33	33.0	00.6	33.0	01.2	33.0	01.6	33.0	01.7	32.9	02.3	32.9	02.9	33
34	34.0	00.6	34.0	01.2	34.0	01.7	34.0	01.8	33.9	02.4	33.9	03.0	34
35	35.0	00.6	35.0	01.2	35.0	01.7	35.0	01.8	34.9	02.4	34.9	03.1	35
36	36.0	00.6	36.0	01.3	36.0	01.8	35.9	01.9	35.9	02.5	35.9	03.1	36
37	37.0	00.6	37.0	01.3	37.0	01.8	36.9	01.9	36.9	02.6	36.9	03.2	37
38	38.0	00.7	38.0	01.3	38.0	01.9	37.9	02.0	37.9	02.7	37.9	03.3	38
39	39.0	00.7	39.0	01.4	39.0	01.9	38.9	02.0	38.9	02.7	38.9	03.4	39
40	40.0	00.7	40.0	01.4	40.0	02.0	39.9	02.1	39.9	02.8	39.8	03.5	40
41	41.0	00.7	41.0	01.4	41.0	02.0	40.9	02.1	40.9	02.9	40.8	03.6	41
42	42.0	00.7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7	42
43	43.0	00.8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.8	43
44	44.0	00.8	44.0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8	44
45	45.0	00.8	45.0	01.6	44.9	02.2	44.9	02.4	44.9	03.1	44.8	03.9	45
46	46.0	00.8	46.0	01.6	45.9	02.3	45.9	02.4	45.9	03.2	45.8	04.0	46
47	47.0	00.8	47.0	01.6	46.9	02.3	46.9	02.5	46.9	03.3	46.8	04.1	47
48	48.0	00.8	48.0	01.7	47.9	02.4	47.9	02.5	47.9	03.4	47.8	04.2	48
49	49.0	00.9	49.0	01.7	48.9	02.4	48.9	02.6	48.9	03.4	48.8	04.3	49
50	50.0	00.9	50.0	01.7	49.9	02.5	49.9	02.6	49.9	03.5	49.8	04.4	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	89 Deg.		88 Deg.		7 $\frac{1}{4}$ Point		87 Deg.		86 Deg.		85 Deg.		

Of LATITUDE and DEPARTURE.

91

Diff.	1 Deg.		2 Deg.		$\frac{1}{4}$ Point		3 Deg.		4 Deg.		5 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	51.0	00.9	51.0	01.8	50.9	02.5	50.9	02.7	50.9	03.6	50.8	04.4	51
52	52.0	00.9	52.0	01.8	51.9	02.6	51.9	02.7	51.9	03.6	51.8	04.5	52
53	53.0	00.9	53.0	01.8	52.9	02.6	52.9	02.8	52.9	03.7	52.8	04.6	53
54	54.0	00.9	54.0	01.9	53.9	02.7	53.9	02.8	53.9	03.8	53.8	04.7	54
55	55.0	01.0	55.0	01.9	54.9	02.7	54.9	02.8	54.9	03.8	54.8	04.8	55
56	56.0	01.0	56.0	02.0	55.9	02.7	55.9	02.9	55.9	03.9	55.8	04.9	56
57	57.0	01.0	57.0	02.0	56.9	02.8	56.9	03.0	56.9	04.0	56.8	05.0	57
58	58.0	01.0	58.0	02.0	57.9	02.8	57.9	03.0	57.9	04.0	57.8	05.1	58
59	59.0	01.0	59.0	02.1	58.9	02.9	58.9	03.1	58.9	04.1	58.8	05.1	59
60	60.0	01.1	60.0	02.1	59.9	02.9	59.9	03.1	59.9	04.2	59.8	05.2	60
61	61.0	01.1	61.0	02.1	60.9	03.0	60.9	03.2	60.9	04.3	60.8	05.3	61
62	62.0	01.1	62.0	02.2	61.9	03.0	61.9	03.2	61.9	04.3	61.8	05.4	62
63	63.0	01.1	63.0	02.2	62.9	03.1	62.9	03.3	62.8	04.4	62.8	05.5	63
64	64.0	01.1	64.0	02.2	63.9	03.1	63.9	03.3	63.8	04.5	63.8	05.6	64
65	65.0	01.1	65.0	02.3	64.9	03.2	64.9	03.4	64.8	04.5	64.8	05.7	65
66	66.0	01.2	66.0	02.3	65.9	03.2	65.9	03.5	65.8	04.6	65.7	05.8	66
67	67.0	01.2	67.0	02.3	66.9	03.3	66.9	03.5	66.8	04.7	66.7	05.8	67
68	68.0	01.2	68.0	02.4	67.9	03.3	67.9	03.6	67.8	04.7	67.7	05.9	68
69	69.0	01.2	69.0	02.4	68.9	03.4	68.9	03.6	68.8	04.8	68.7	06.0	69
70	70.0	01.2	70.0	02.4	69.9	03.4	69.9	03.7	69.8	04.9	69.7	06.1	70
71	71.0	01.2	71.0	02.5	70.9	03.5	70.9	03.7	70.8	05.0	70.7	06.2	71
72	72.0	01.3	72.0	02.5	71.9	03.5	71.9	03.8	71.8	05.0	71.7	06.3	72
73	73.0	01.3	73.0	02.5	72.9	03.6	72.9	03.8	72.8	05.1	72.7	06.4	73
74	74.0	01.3	74.0	02.6	73.9	03.6	73.9	03.9	73.8	05.2	73.7	06.5	74
75	75.0	01.3	75.0	02.6	74.9	03.7	74.9	03.9	74.8	05.2	74.7	06.5	75
76	76.0	01.3	76.0	02.7	75.9	03.7	75.9	04.0	75.8	05.3	75.7	06.6	76
77	77.0	01.3	77.0	02.7	76.9	03.8	76.9	04.0	76.8	05.4	76.7	06.7	77
78	78.0	01.4	78.0	02.7	77.9	03.8	77.9	04.1	77.8	05.4	77.7	06.8	78
79	79.0	01.4	79.0	02.8	78.9	03.9	78.9	04.1	78.8	05.5	78.7	06.9	79
80	80.0	01.4	80.0	02.8	79.9	03.9	79.9	04.2	79.8	05.6	79.7	07.0	80
81	81.0	01.4	81.0	02.8	80.9	04.0	80.9	04.2	80.8	05.7	80.7	07.1	81
82	82.0	01.4	81.9	02.9	81.9	04.0	81.9	04.3	81.8	05.7	81.7	07.2	82
83	83.0	01.5	82.9	02.9	82.9	04.1	82.9	04.3	82.8	05.8	82.7	07.2	83
84	84.0	01.5	83.9	02.9	83.9	04.1	83.9	04.4	83.8	05.9	83.7	07.3	84
85	85.0	01.5	84.9	03.0	84.9	04.2	84.9	04.4	84.8	05.9	84.7	07.4	85
86	86.0	01.5	85.9	03.0	85.9	04.2	85.9	04.5	85.8	06.0	85.7	07.5	86
87	87.0	01.5	86.9	03.0	86.9	04.3	86.9	04.6	86.8	06.1	86.7	07.6	87
88	88.0	01.5	87.9	03.1	87.9	04.3	87.9	04.6	87.8	06.1	87.7	07.7	88
89	89.0	01.6	88.9	03.1	88.9	04.4	88.9	04.7	88.8	06.2	88.7	07.8	89
90	90.0	01.6	89.9	03.1	89.9	04.4	89.9	04.7	89.8	06.3	89.7	07.8	90
91	91.0	01.6	90.9	03.2	90.9	04.5	90.9	04.8	90.8	06.4	90.7	07.9	91
92	92.0	01.6	91.9	03.2	91.9	04.5	91.9	04.8	91.8	06.4	91.6	08.0	92
93	93.0	01.6	92.9	03.2	92.9	04.6	92.9	04.9	92.8	06.5	92.6	08.1	93
94	94.0	01.6	93.9	03.3	93.9	04.6	93.9	04.9	93.8	06.6	93.6	08.2	94
95	95.0	01.7	94.9	03.3	94.9	04.7	94.9	05.0	94.8	06.6	94.6	08.3	95
96	96.0	01.7	95.9	03.4	95.9	04.7	95.9	05.0	95.8	06.7	95.6	08.4	96
97	97.0	01.7	96.9	03.4	96.9	04.8	96.9	05.1	96.8	06.8	96.6	08.5	97
98	98.0	01.7	97.9	03.4	97.9	04.8	97.9	05.1	97.8	06.8	97.6	08.5	98
99	99.0	01.7	98.9	03.5	98.9	04.9	98.9	05.2	98.8	06.9	98.6	08.6	99
100	100.0	01.7	99.9	03.5	99.9	04.9	99.9	05.2	99.8	07.0	99.6	08.7	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	89 Deg.		88 Deg.		$7\frac{1}{4}$ Point		87 Deg.		86 Deg.		85 Deg.		

A Table of DIFFERENCE

Diff. 1	$\frac{1}{2}$ Point		6 Deg.		7 Deg.		8 Deg.		$\frac{3}{4}$ Point		9 Deg.		Diff. 1
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.2	1
2	02.0	00.2	02.0	00.2	02.0	00.2	02.0	00.3	02.0	00.3	02.0	00.3	2
3	03.0	00.3	03.0	00.3	03.0	00.4	03.0	00.4	03.0	00.4	03.0	00.5	3
4	04.0	00.4	04.0	00.4	04.0	00.5	04.0	00.6	04.0	00.6	03.9	00.6	4
5	05.0	00.5	05.0	00.5	05.0	00.6	05.0	00.7	04.9	00.7	04.9	00.8	5
6	06.0	00.6	06.0	00.6	06.0	00.7	05.9	00.8	05.9	00.9	05.9	00.9	6
7	07.0	00.7	07.0	00.7	06.9	00.9	06.9	01.0	06.9	01.0	06.9	01.1	7
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01.1	07.9	01.2	07.9	01.3	8
9	09.0	00.9	08.9	00.9	08.9	01.1	08.9	01.2	08.9	01.3	08.9	01.4	9
10	10.0	01.0	09.9	01.0	09.9	01.2	09.9	01.4	09.9	01.5	09.9	01.6	10
11	10.9	01.1	10.9	01.1	10.9	01.3	10.9	01.5	10.9	01.6	10.9	01.7	11
12	11.9	01.2	11.9	01.3	11.9	01.5	11.9	01.7	11.9	01.8	11.9	01.9	12
13	12.9	01.3	12.9	01.4	12.9	01.6	12.9	01.8	12.9	01.9	12.8	02.0	13
14	13.9	01.4	13.9	01.5	13.9	01.7	13.9	01.9	13.8	02.1	13.8	02.2	14
15	14.9	01.5	14.9	01.6	14.9	01.8	14.9	02.1	14.8	02.2	14.8	02.3	15
16	15.9	01.6	15.9	01.7	15.9	01.9	15.8	02.2	15.8	02.3	15.8	02.5	16
17	16.9	01.7	16.9	01.8	16.9	02.1	16.8	02.4	16.8	02.5	16.8	02.7	17
18	17.9	01.8	17.9	01.9	17.9	02.2	17.8	02.5	17.8	02.6	17.8	02.8	18
19	18.9	01.9	18.9	02.0	18.9	02.3	18.8	02.6	18.8	02.8	18.8	03.0	19
20	19.9	02.0	19.9	02.1	19.8	02.4	19.8	02.8	19.8	02.9	19.8	03.1	20
21	20.9	02.1	20.9	02.2	20.8	02.6	20.8	02.9	20.8	03.1	20.7	03.3	21
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4	22
23	22.9	02.3	22.9	02.4	22.8	02.8	22.8	03.2	22.8	03.4	22.7	03.6	23
24	23.9	02.4	23.9	02.5	23.8	02.9	23.8	03.3	23.7	03.5	23.7	03.8	24
25	24.9	02.4	24.9	02.6	24.8	03.0	24.8	03.5	24.7	03.7	24.7	03.9	25
26	25.9	02.5	25.9	02.7	25.8	03.2	25.7	03.6	25.7	03.8	25.7	04.1	26
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.8	26.7	04.0	26.7	04.2	27
28	27.9	02.7	27.8	02.9	27.8	03.4	27.7	03.9	27.7	04.1	27.7	04.4	28
29	28.9	02.8	28.8	03.0	28.8	03.5	28.7	04.0	28.7	04.3	28.6	04.5	29
30	29.9	02.9	29.8	03.1	29.8	03.7	29.7	04.2	29.7	04.4	29.6	04.7	30
31	30.8	03.0	30.8	03.2	30.8	03.8	30.7	04.3	30.7	04.5	30.6	04.9	31
32	31.8	03.1	31.8	03.3	31.8	03.9	31.7	04.5	31.7	04.7	31.6	05.1	32
33	32.8	03.2	32.8	03.4	32.8	04.0	32.7	04.6	32.6	04.8	32.6	05.2	33
34	33.8	03.3	33.8	03.6	33.7	04.1	33.7	04.7	33.6	05.0	33.6	05.4	34
35	34.8	03.4	34.8	03.7	34.7	04.3	34.7	04.9	34.6	05.1	34.6	05.5	35
36	35.8	03.5	35.8	03.8	35.7	04.4	35.6	05.0	35.6	05.3	35.6	05.6	36
37	36.8	03.6	36.8	03.9	36.7	04.5	36.6	05.1	36.6	05.4	36.5	05.8	37
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37.6	05.6	37.5	05.9	38
39	38.8	03.8	38.8	04.1	38.7	04.8	38.6	05.4	38.6	05.7	38.5	06.1	39
40	39.8	03.9	39.8	04.2	39.7	04.9	39.6	05.5	39.6	05.9	39.5	06.3	40
41	40.8	04.0	40.8	04.3	40.7	05.0	40.6	05.7	40.6	06.0	40.5	06.4	41
42	41.8	04.1	41.8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6	42
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	06.7	43
44	43.8	04.3	43.8	04.6	43.7	05.4	43.6	06.1	43.5	06.5	43.5	06.9	44
45	44.8	04.4	44.8	04.7	44.7	05.5	44.6	06.3	44.5	06.6	44.4	07.0	45
46	45.8	04.5	45.7	04.8	45.7	05.6	45.6	06.4	45.5	06.7	45.4	07.2	46
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06.6	46.5	06.9	46.4	07.3	47
48	47.8	04.7	47.7	05.0	47.6	05.9	47.5	06.7	47.5	07.0	47.4	07.5	48
49	48.8	04.8	48.7	05.1	48.6	06.0	48.5	06.8	48.5	07.2	48.4	07.7	49
50	49.8	04.9	49.7	05.2	49.6	06.1	49.5	07.0	49.5	07.3	49.4	07.8	50
Diff. 1	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff. 1
	$7\frac{1}{2}$ Point		84 Deg.		83 Deg.		82 Deg.		$7\frac{1}{2}$ Point		81 Deg.		

1/2 Point	6 Deg.		7 eg.		8 Deg.		1/2 Point		9 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.8	05.0	50.7	05.3	50.6	06.2	50.5	07.1	50.4	08.0	51
52	51.7	05.1	51.7	05.4	51.6	06.3	51.5	07.2	51.4	08.1	52
53	52.7	05.2	52.7	05.5	52.6	06.5	52.5	07.4	52.4	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06.6	53.5	07.5	53.4	08.4	54
55	54.7	05.4	54.7	05.7	54.6	06.7	54.5	07.7	54.4	08.6	55
56	55.7	05.5	55.7	05.9	55.6	06.8	55.5	07.8	55.4	08.8	56
57	56.7	05.6	56.7	06.0	56.6	06.9	56.4	07.9	56.4	08.9	57
58	57.7	05.7	57.7	06.1	57.6	07.1	57.4	08.1	57.4	09.1	58
59	58.7	05.8	58.7	06.2	58.6	07.2	58.4	08.2	58.4	09.2	59
60	59.7	05.9	59.7	06.3	59.5	07.3	59.4	08.4	59.4	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	09.5	61
62	61.7	06.1	61.7	06.5	61.5	07.6	61.4	08.6	61.3	09.7	62
63	62.7	06.2	62.7	06.6	62.5	07.7	62.4	08.8	62.3	09.9	63
64	63.7	06.3	63.6	06.7	63.5	07.8	63.4	08.9	63.3	10.0	64
65	64.7	06.4	64.6	06.8	64.5	07.9	64.4	09.0	64.3	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09.2	65.3	10.3	66
67	66.7	06.6	66.6	07.0	66.5	08.2	66.3	09.3	66.3	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08.3	67.3	09.5	67.3	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.3	10.8	69
70	69.7	06.9	69.6	07.3	69.5	08.5	69.3	09.7	69.2	10.9	70
71	70.7	07.0	70.6	07.4	70.5	08.7	70.3	09.9	70.2	11.1	71
72	71.7	07.1	71.6	07.5	71.5	08.8	71.3	10.0	71.2	11.3	72
73	72.6	07.2	72.6	07.6	72.5	08.9	72.3	10.2	72.2	11.4	73
74	73.6	07.3	73.6	07.7	73.4	09.0	73.3	10.3	73.2	11.6	74
75	74.6	07.3	74.6	07.8	74.4	09.1	74.3	10.4	74.2	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10.6	75.2	11.9	76
77	76.6	07.5	76.6	08.0	76.4	09.4	76.3	10.7	76.2	12.0	77
78	77.6	07.6	77.6	08.1	77.4	09.5	77.2	10.9	77.2	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09.6	78.2	11.0	78.1	12.4	79
80	79.6	07.8	79.6	08.4	79.4	09.8	79.2	11.1	79.1	12.5	80
81	80.6	07.9	80.6	08.5	80.4	09.9	80.2	11.3	80.1	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81.1	12.8	82
83	82.6	08.1	82.5	08.7	82.4	10.1	82.2	11.6	82.1	13.0	83
84	83.6	08.2	83.5	08.8	83.4	10.2	83.2	11.7	83.1	13.1	84
85	84.6	08.3	84.5	08.9	84.4	10.4	84.2	11.8	84.1	13.3	85
86	85.6	08.4	85.5	09.0	85.4	10.5	85.2	12.0	85.1	13.4	86
87	86.6	08.5	86.5	09.1	86.3	10.6	86.2	12.1	86.0	13.6	87
88	87.6	08.6	87.5	09.2	87.3	10.7	87.1	12.2	87.0	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.8	88.1	12.4	88.0	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	14.1	90
91	90.6	08.9	90.5	09.5	90.3	11.1	90.1	12.7	90.0	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	14.4	92
93	92.6	09.1	92.5	09.7	92.3	11.3	92.1	12.9	92.0	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11.5	93.1	13.1	93.0	14.7	94
95	94.5	09.3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95.1	13.4	95.0	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.1	13.5	96.0	15.2	97
98	97.5	09.6	97.5	10.2	97.3	11.9	97.0	13.6	96.9	15.3	98
99	98.5	09.7	98.5	10.3	98.3	12.1	98.0	13.8	97.9	15.5	99
100	99.5	09.8	99.4	10.4	99.2	12.2	99.0	13.9	98.9	15.6	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
7 1/2 Points	84 Deg.		83 Deg.		82 Deg.		7 1/2 Point.		81 Deg.		

Diff.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	1
2	02.0	00.3	02.0	00.4	02.0	00.4	02.0	00.4	01.9	00.4	01.9	00.5	2
3	03.0	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7	3
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0	4
5	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.0	04.9	01.1	04.9	01.2	5
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4	6
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7	7
8	07.9	01.4	07.9	01.5	07.8	01.6	07.8	01.7	07.8	01.8	07.8	01.9	8
9	08.9	01.6	08.8	01.7	08.8	01.8	08.8	01.9	08.8	02.0	08.7	02.2	9
10	09.8	01.7	09.8	01.9	09.8	02.0	09.8	02.1	09.7	02.2	09.7	02.4	10
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7	11
12	11.8	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9	12
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1	13
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4	14
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.6	03.6	15
16	15.8	02.8	15.7	03.1	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9	16
17	16.7	03.0	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1	17
18	17.7	03.1	17.7	03.4	17.7	03.5	17.6	03.7	17.5	04.0	17.5	04.4	18
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.3	18.4	04.6	19
20	19.7	03.5	19.6	03.8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8	20
21	20.7	03.6	20.6	04.0	20.6	04.1	20.5	04.4	20.5	04.7	20.4	05.1	21
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3	22
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6	23
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8	24
25	24.6	04.3	24.5	04.8	24.5	04.9	24.5	05.2	24.4	05.6	24.3	06.0	25
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3	26
27	26.6	04.7	26.5	05.2	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5	27
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27.3	06.3	27.2	06.8	28
29	28.6	05.0	28.5	05.5	28.4	05.7	28.4	06.0	28.3	06.5	28.1	07.0	29
30	29.5	05.2	29.4	05.7	29.4	05.9	29.3	06.2	29.2	06.7	29.1	07.3	30
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30.2	07.0	30.1	07.5	31
32	31.5	05.6	31.4	06.1	31.4	06.2	31.3	06.7	31.2	07.2	31.0	07.7	32
33	32.5	05.7	32.4	06.3	32.4	06.4	32.3	06.9	32.2	07.4	32.0	08.0	33
34	33.5	05.9	33.4	06.5	33.3	06.6	33.3	07.1	33.1	07.6	33.0	08.2	34
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34.1	07.9	34.0	08.5	35
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	08.7	36
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.1	08.3	35.9	09.0	37
38	37.4	06.6	37.3	07.2	37.3	07.4	37.2	07.9	37.0	08.5	36.9	09.2	38
39	38.4	06.8	38.3	07.4	38.3	07.6	38.1	08.1	38.0	08.8	37.8	09.4	39
40	39.4	06.9	39.3	07.6	39.2	07.8	39.1	08.3	39.0	09.0	38.8	09.7	40
41	40.4	07.1	40.2	07.8	40.2	08.0	40.1	08.5	39.9	09.2	39.8	09.9	41
42	41.4	07.3	41.2	08.0	41.2	08.2	41.1	08.7	40.9	09.4	40.8	10.2	42
43	42.3	07.5	42.2	08.2	42.2	08.4	42.1	08.9	41.9	09.7	41.7	10.4	43
44	43.3	07.6	43.2	08.4	43.2	08.6	43.0	09.1	42.9	09.9	42.7	10.6	44
45	44.3	07.8	44.2	08.6	44.1	08.8	44.0	09.4	43.8	10.1	43.7	10.9	45
46	45.3	08.0	45.2	08.8	45.1	09.0	45.0	09.6	44.8	10.3	44.6	11.1	46
47	46.3	08.2	46.1	09.0	46.1	09.2	46.0	09.8	45.8	10.6	45.6	11.4	47
48	47.3	08.3	47.1	09.2	47.1	09.4	47.0	10.0	46.8	10.8	46.6	11.6	48
49	48.3	08.5	48.1	09.3	48.1	09.6	47.9	10.2	47.7	11.0	47.5	11.9	49
50	49.2	08.7	49.1	09.5	49.0	09.8	48.9	10.4	48.7	11.2	48.5	12.1	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	80 Deg.		79 Deg.		7 Point		78 Deg.		77 Deg.		76 Deg.		

	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		
Diff.	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Diff.
51	50.2	08.9	50.1	09.7	50.0	10.0	49.9	10.6	49.7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0	10.1	50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52.0	10.3	51.8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54.8	11.6	54.6	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.9	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13.8	57
58	57.1	10.1	56.9	11.1	56.9	11.3	56.7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58.7	12.5	58.5	13.5	58.2	14.5	60
61	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11.8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62.0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15.2	63
64	63.0	11.1	62.8	12.2	62.8	12.5	62.6	13.3	62.4	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.8	12.7	63.6	13.5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64.6	13.7	64.3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.3	15.3	66.0	16.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14.6	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69.7	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17.2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70.4	15.0	70.2	16.2	69.9	17.4	72
73	71.9	12.7	71.7	13.9	71.6	14.2	71.4	15.2	71.1	16.4	70.8	17.7	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14.3	73.6	14.6	73.4	15.6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74.6	14.5	74.5	14.8	74.3	15.8	74.1	17.1	73.7	18.4	76
77	75.8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.7	19.1	79
80	78.8	13.9	78.5	15.3	78.5	15.6	78.2	16.6	78.0	18.0	77.6	19.4	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18.2	78.6	19.6	81
82	80.8	14.2	80.5	15.6	80.4	16.0	80.2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81.5	15.8	81.4	16.2	81.2	17.3	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82.2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83.8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.8	19.6	84.4	21.0	87
88	86.7	15.3	86.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	86.7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.1	89.3	17.8	89.0	18.9	88.7	20.5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19.1	89.6	20.7	89.3	22.3	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.3	90.6	20.9	90.2	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.6	16.5	93.3	18.1	93.2	18.5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94.9	20.2	94.5	21.8	94.1	23.5	97
98	96.5	17.0	96.2	18.7	96.1	19.1	95.9	20.4	95.5	22.0	95.1	23.7	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	23.9	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.5	97.0	24.2	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	80 Deg.		79 Deg.		7 Point		78 Deg.		77 Deg.		76 Deg.		

73.9

147.8

25.

Diff.	1 $\frac{1}{2}$ Point		15 Deg.		16 Deg.		1 $\frac{1}{2}$ Point		17 Deg.		18 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.5	1
2	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.9	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.5	05.8	01.7	05.7	01.7	05.7	01.8	05.7	01.9	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.7	02.5	08.6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02.4	09.7	02.5	09.7	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.7	10.6	02.8	10.6	03.0	10.5	03.2	10.6	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.5	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.6	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.1	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.1	06.6	23.0	07.0	22.9	07.0	22.8	07.4	24
25	24.2	06.1	24.1	06.5	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	06.3	25.1	06.7	25.0	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	26.0	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.8	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.7	28
29	28.1	07.0	28.0	07.5	27.9	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.8	30.9	08.3	30.8	08.8	30.6	09.3	30.6	09.4	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.1	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.2	37
38	36.9	09.2	36.7	09.8	36.6	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.4	38.5	11.0	38.3	11.6	38.3	11.7	38.0	12.4	40
41	39.8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.4	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45.9	13.9	45.9	14.0	45.7	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
Diff.	Dep	Lat	Le	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	6 Point		75 Deg.		74 Deg.		6 $\frac{1}{2}$ Point		73 Deg.		72 Deg.		

Dif. 1	1½ Point		15 Deg.		16 Deg.		1½ Point		17 Deg.		18 Deg.		Dif. 1
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	49.5	12.4	49.3	13.2	49.0	14.1	48.8	14.8	48.8	14.9	48.5	15.8	51
52	50.4	12.6	50.2	13.5	50.0	14.3	49.7	15.1	49.7	15.2	49.4	16.1	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	53
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51.6	15.8	51.3	16.7	54
55	53.3	13.4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17.0	55
56	54.3	13.6	54.1	14.5	53.8	15.4	53.6	16.2	53.5	16.4	53.3	17.3	56
57	55.3	13.9	55.1	14.8	54.8	15.7	54.5	16.5	54.5	16.7	54.2	17.6	57
58	56.3	14.1	56.0	15.0	55.8	16.0	55.5	16.8	55.5	17.0	55.2	17.9	58
59	57.2	14.3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.3	56.1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17.4	57.4	17.5	57.1	18.5	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	19.8	61
62	60.1	15.1	59.9	16.0	59.6	17.1	59.3	18.0	59.3	18.1	59.0	19.2	62
63	61.1	15.3	60.9	16.3	60.6	17.4	60.3	18.3	60.2	18.4	59.9	19.5	63
64	62.1	15.6	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17.9	62.2	18.9	62.2	19.0	61.8	20.1	65
66	64.0	16.0	63.7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20.4	66
67	65.0	16.3	64.7	17.3	64.4	18.5	64.1	19.4	64.1	19.6	63.7	20.7	67
68	66.0	16.5	65.7	17.6	65.4	18.7	65.1	19.7	65.0	19.9	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19.0	66.0	20.0	66.0	20.2	65.6	21.3	69
70	67.9	17.0	67.6	18.1	67.3	19.3	67.0	20.3	66.9	20.5	66.6	21.6	70
71	68.9	17.3	68.6	18.4	68.3	19.6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19.8	68.9	20.9	68.8	21.1	68.5	22.2	72
73	70.8	17.7	70.5	18.9	70.2	20.1	69.9	21.2	69.8	21.3	69.4	22.6	73
74	71.8	18.0	71.5	19.2	71.1	20.4	70.8	21.5	70.8	21.6	70.4	22.9	74
75	72.7	18.2	72.4	19.4	72.1	20.7	71.8	21.8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.1	20.9	72.7	22.1	72.7	22.2	72.3	23.5	76
77	74.7	18.7	74.4	19.9	74.0	21.2	73.7	22.4	73.6	22.5	73.2	23.8	77
78	75.7	19.0	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22.8	74.2	24.1	78
79	76.6	19.2	76.3	20.4	75.9	21.8	75.6	22.9	75.5	23.1	75.1	24.4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23.2	76.5	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22.3	77.5	23.5	77.5	23.7	77.0	25.0	81
82	79.5	19.9	79.2	21.2	78.8	22.6	78.5	23.8	78.4	24.0	78.0	25.3	82
83	80.5	20.2	80.2	21.5	79.8	22.9	79.4	24.1	79.4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.7	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82.4	20.7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	80.8	26.3	85
86	83.4	20.9	83.1	22.3	82.7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84.4	21.1	84.0	22.5	83.6	24.0	83.3	25.3	83.2	25.4	82.7	26.9	87
88	85.4	21.4	85.0	22.8	84.6	24.3	84.2	25.5	84.2	25.7	83.7	27.2	88
89	86.3	21.6	86.0	23.0	85.6	24.5	85.2	25.8	85.1	26.0	84.6	27.5	89
90	87.3	21.9	86.9	23.3	86.5	24.8	86.1	26.1	86.1	26.3	85.6	27.8	90
91	88.3	22.1	87.9	23.5	87.5	25.1	87.1	26.4	87.0	26.6	86.5	28.1	91
92	89.2	22.4	88.9	23.8	88.4	25.4	88.0	26.7	88.0	26.9	87.5	28.4	92
93	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.9	27.2	88.4	28.7	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89.4	29.0	94
95	92.1	23.1	91.8	24.6	91.3	26.2	90.9	27.6	90.8	27.8	90.4	29.4	95
96	93.1	23.3	92.7	24.8	92.3	26.5	91.9	27.9	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	28.2	92.8	28.4	92.3	30.0	97
98	95.1	23.8	94.7	25.4	94.2	27.0	93.8	28.4	93.7	28.7	93.2	30.3	98
99	96.0	24.1	95.6	25.6	95.2	27.3	94.7	28.7	94.7	28.9	94.2	30.6	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95.7	29.0	95.6	29.2	95.1	30.9	100
Dif.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dif.
	6¼ Point		75 Deg.		74 Deg.		6½ Point		73 Deg.		72 Deg.		

Diff. 1	19 Deg.		1 $\frac{3}{4}$ Point		20 Deg.		21 Deg.		22 Deg.		2 Points		Diff. 1
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.1	00.9	00.4	1
2	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	02.0	05.6	02.0	05.6	02.1	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.6	02.4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.1	04.7	12.1	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.5	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.2	16.8	06.5	16.7	06.7	16.6	06.9	18
19	18.0	06.2	17.9	06.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.8	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.7	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.6	08.2	22.4	08.6	22.3	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.2	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.3	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.8	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.9	11.5	29.7	12.0	29.6	12.3	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.5	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.0	34.8	12.5	34.8	12.7	34.5	13.3	34.3	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	35.1	14.5	38
39	36.9	12.7	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	37.0	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.4	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.7	16.8	44
45	42.5	14.7	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.9	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.9	16.5	42.7	17.4	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	16.0	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.4	45.3	18.8	49
50	47.3	16.3	47.1	16.8	47.0	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
Diff. 1	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff. 1
	71 Deg.		6 $\frac{1}{4}$ Point		70 Deg.		69 Deg.		68 Deg.		6 Points		

Of LATITUDE and DEPARTURE.

99

Diff.	19 Deg.		1 $\frac{3}{4}$ Point		20 Deg.		21 Deg.		22 Deg.		2 Point		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	48.2	16.6	48.0	17.2	47.9	17.4	47.6	18.3	47.3	19.1	47.1	19.5	51
52	49.2	16.9	49.0	17.5	48.9	17.8	48.5	18.6	48.2	19.5	48.0	19.9	52
53	50.1	17.3	49.9	17.9	49.8	18.1	49.5	19.0	49.1	19.9	49.0	20.3	53
54	51.0	17.6	50.8	18.2	50.7	18.5	50.4	19.4	50.1	20.2	49.9	20.7	54
55	52.0	17.9	51.8	18.5	51.7	18.8	51.3	19.7	51.0	20.6	50.8	21.0	55
56	52.9	18.2	52.7	18.9	52.6	19.2	52.3	20.1	51.9	21.0	51.7	21.4	56
57	53.9	18.6	53.7	19.2	53.6	19.5	53.2	20.4	52.8	21.4	52.7	21.8	57
58	54.8	18.9	54.6	19.5	54.5	19.8	54.1	20.8	53.8	21.7	53.6	22.2	58
59	55.8	19.2	55.5	19.9	55.4	20.2	55.1	21.1	54.7	22.1	54.5	22.6	59
60	56.7	19.5	56.5	20.2	56.4	20.5	56.0	21.5	55.6	22.5	55.4	23.0	60
61	57.7	19.9	57.4	20.6	57.3	20.9	56.9	21.9	56.5	22.8	56.4	23.3	61
62	58.6	20.2	58.4	20.9	58.3	21.2	57.9	22.2	57.5	23.2	57.3	23.7	62
63	59.6	20.5	59.3	21.2	59.2	21.5	58.8	22.6	58.4	23.6	58.2	24.1	63
64	60.5	20.8	60.3	21.6	60.1	21.9	59.7	22.9	59.3	24.0	59.1	24.5	64
65	61.5	21.2	61.2	21.9	61.1	22.2	60.7	23.3	60.3	24.3	60.1	24.9	65
66	62.4	21.5	62.1	22.2	62.0	22.6	61.6	23.7	61.2	24.7	61.0	25.3	66
67	63.3	21.8	63.1	22.6	63.0	22.9	62.6	24.0	62.1	25.1	61.9	25.6	67
68	64.3	22.1	64.0	22.9	63.9	23.3	63.5	24.4	63.0	25.5	62.8	26.0	68
69	65.2	22.5	65.0	23.2	64.8	23.6	64.4	24.7	64.0	25.8	63.7	26.4	69
70	66.2	22.8	65.9	23.6	65.8	23.9	65.4	25.1	64.9	26.2	64.7	26.8	70
71	67.1	23.1	66.8	23.9	66.7	24.3	66.3	25.4	65.8	26.6	65.6	27.2	71
72	68.1	23.4	67.8	24.3	67.7	24.6	67.2	25.8	66.8	27.0	66.5	27.6	72
73	69.0	23.8	68.7	24.6	68.6	25.0	68.2	26.2	67.7	27.3	67.4	27.9	73
74	70.0	24.1	69.7	24.9	69.5	25.3	69.1	26.5	68.6	27.7	68.4	28.3	74
75	70.9	24.4	70.6	25.3	70.5	25.6	70.0	26.9	69.5	28.1	69.3	28.7	75
76	71.9	24.7	71.6	25.6	71.4	26.0	71.0	27.2	70.5	28.5	70.2	29.1	76
77	72.8	25.1	72.5	25.9	72.4	26.3	71.9	27.6	71.4	28.8	71.1	29.5	77
78	73.7	25.4	73.4	26.3	73.3	26.7	72.8	28.0	72.3	29.2	72.1	29.8	78
79	74.7	25.7	74.4	26.6	74.2	27.0	73.8	28.3	73.2	29.6	73.0	30.2	79
80	75.6	26.0	75.3	27.0	75.2	27.4	74.7	28.7	74.2	30.0	73.9	30.6	80
81	76.6	26.4	76.3	27.3	76.1	27.7	75.6	29.0	75.1	30.3	74.8	31.0	81
82	77.5	26.7	77.2	27.6	77.1	28.0	76.6	29.4	76.0	30.7	75.8	31.4	82
83	78.5	27.0	78.1	28.0	78.0	28.4	77.5	29.7	77.0	31.1	76.7	31.8	83
84	79.4	27.3	79.1	28.3	78.9	28.7	78.4	30.1	77.9	31.5	77.6	32.1	84
85	80.4	27.7	80.0	28.6	79.9	29.1	79.4	30.5	78.8	31.8	78.5	32.5	85
86	81.3	28.0	81.0	29.0	80.8	29.4	80.3	30.8	79.7	32.2	79.5	32.9	86
87	82.3	28.3	81.9	29.3	81.8	29.8	81.2	31.2	80.7	32.6	80.4	33.3	87
88	83.2	28.7	82.9	29.6	82.7	30.1	82.2	31.5	81.6	33.0	81.3	33.7	88
89	84.1	29.0	83.8	30.0	83.6	30.4	83.1	31.9	82.5	33.3	82.2	34.1	89
90	85.1	29.3	84.7	30.3	84.6	30.8	84.0	32.3	83.4	33.7	83.2	34.4	90
91	86.0	29.6	85.7	30.7	85.5	31.1	85.0	32.6	84.4	34.1	84.1	34.8	91
92	87.0	30.0	86.6	31.0	86.5	31.5	85.9	33.0	85.3	34.5	85.0	35.2	92
93	87.9	30.3	87.6	31.3	87.4	31.8	86.8	33.3	86.2	34.8	85.9	35.6	93
94	88.9	30.6	88.5	31.7	88.3	32.1	87.8	33.7	87.2	35.2	86.8	36.0	94
95	89.8	30.9	89.4	32.0	89.3	32.5	88.7	34.0	88.1	35.6	87.8	36.4	95
96	90.8	31.3	90.4	32.3	90.2	32.8	89.6	34.4	89.0	36.0	88.7	36.7	96
97	91.7	31.6	91.3	32.7	91.1	33.2	90.6	34.8	89.9	36.3	89.6	37.1	97
98	92.7	31.9	92.3	33.0	92.1	33.5	91.5	35.1	90.9	36.7	90.5	37.5	98
99	93.6	32.2	93.2	33.4	93.0	33.9	92.4	35.5	91.8	37.1	91.5	37.9	99
100	94.5	32.6	94.2	33.7	94.0	34.2	93.4	35.8	92.7	37.5	92.4	38.3	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	71 Deg.		6 $\frac{1}{4}$ Point		70 Deg.		69 Deg.		68 Deg.		6 Point		

Diff.	23 Deg.		24 Deg.		25 Deg.		2 $\frac{1}{4}$ Point		26 Deg.		27 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.5	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.7	01.6	03.6	01.7	03.6	01.7	03.6	01.8	03.6	01.8	4
5	04.6	02.0	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.3	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.8	05.6	11.7	05.7	11.6	05.9	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	06.0	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.8	14.4	06.9	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.5	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.5	18.1	08.6	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.3	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.6	19.6	10.0	22
23	21.2	09.0	21.0	09.4	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.8	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.8	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.9	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.2	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.3	14.1	29.7	14.5	29.4	15.0	33
34	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.5	33.8	15.0	33.5	15.6	33.4	15.8	33.3	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.5	34.4	16.1	34.4	16.2	34.2	16.7	33.9	17.3	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.1	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.3	16.9	36.2	17.1	36.0	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.9	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.1	44.8	19.9	44.4	20.7	44.3	20.9	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.5	22.7	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	67 Deg.		66 Deg.		65 Deg.		5 $\frac{3}{4}$ Point		64 Deg.		63 Deg.		

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Diff.	23 Deg.		24 Deg.		25 Deg.		2 $\frac{1}{4}$ Point		26 Deg.		27 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	46.9	19.9	46.6	20.7	46.2	21.6	46.1	21.8	45.8	22.4	45.4	23.2	51
52	47.9	20.3	47.5	21.1	47.1	22.0	47.0	22.2	46.7	22.8	46.3	23.6	52
53	48.8	20.7	48.4	21.6	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21.1	49.3	22.0	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51.2	22.8	50.8	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	22.7	53.0	23.6	52.6	24.5	52.4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.1	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.7	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25.8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	57.0	26.9	56.6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.1	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.8	25.8	60.3	26.8	59.8	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.6	28.7	61.5	29.1	61.1	29.8	60.6	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27.3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.4	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30.4	63.8	31.1	63.3	32.2	71
72	66.3	28.1	65.8	29.3	65.3	30.4	65.1	30.8	64.7	31.6	64.2	32.7	72
73	67.2	28.5	66.7	29.7	66.2	30.8	66.0	31.2	65.6	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.5	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32.9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.8	68.6	35.0	77
78	71.8	30.5	71.3	31.7	70.7	33.0	70.5	33.4	70.1	34.2	69.5	35.4	78
79	72.7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.0	34.6	70.4	35.9	79
80	73.6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.3	36.3	80
81	74.6	31.6	74.0	32.9	73.4	34.2	73.2	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73.1	37.2	82
83	76.4	32.4	75.8	33.7	75.2	35.1	75.0	35.5	74.5	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.1	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	76.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	35.8	79.8	37.2	79.6	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.5	80.2	40.9	90
91	83.8	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.9	81.1	41.3	91
92	84.7	35.6	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41.2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.3	37.5	87.7	39.0	87.0	40.6	86.8	41.0	86.3	42.1	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.4	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.1	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.0	39.1	91.4	40.7	90.6	42.3	90.4	42.8	89.9	43.8	89.1	45.4	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	67 Deg.		66 Deg.		65 Deg.		5 $\frac{3}{4}$ Point		64 Deg.		63 Deg.		

Diff.	28 Deg.		29 Point		29 Deg.		30 Deg.		29 Point		31 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	1
2	01.8	00.9	01.8	00.9	01.7	01.0	01.7	01.0	01.7	01.0	01.7	01.0	2
3	02.6	01.4	02.6	01.4	02.6	01.5	02.6	01.5	02.6	01.5	02.6	01.5	3
4	03.5	01.9	03.5	01.9	03.5	01.9	03.5	02.0	03.4	02.1	03.4	02.1	4
5	04.4	02.3	04.4	02.4	04.4	02.4	04.3	02.5	04.3	02.6	04.3	02.6	5
6	05.3	02.8	05.3	02.8	05.2	02.9	05.2	03.0	05.1	03.1	05.1	03.1	6
7	06.2	03.3	06.2	03.3	06.1	03.4	06.1	03.5	06.0	03.6	06.0	03.6	7
8	07.1	03.8	07.1	03.8	07.0	03.9	06.9	04.0	06.9	04.1	06.9	04.1	8
9	07.9	04.2	07.9	04.2	07.9	04.4	07.8	04.5	07.7	04.6	07.7	04.6	9
10	08.8	04.7	08.8	04.7	08.7	04.8	08.7	05.0	08.6	05.1	08.6	05.1	10
11	09.7	05.2	09.7	05.2	09.6	05.3	09.5	05.5	09.4	05.7	09.4	05.7	11
12	10.6	05.6	10.6	05.7	10.5	05.8	10.4	06.0	10.3	06.2	10.3	06.2	12
13	11.5	06.1	11.5	06.1	11.4	06.3	11.3	06.5	11.1	06.7	11.1	06.7	13
14	12.4	06.6	12.3	06.6	12.2	06.8	12.1	07.0	12.0	07.2	12.0	07.2	14
15	13.2	07.0	13.2	07.1	13.1	07.3	13.0	07.5	12.9	07.7	12.9	07.7	15
16	14.1	07.5	14.1	07.5	14.0	07.8	13.9	08.0	13.7	08.2	13.7	08.2	16
17	15.0	08.0	15.0	08.0	14.9	08.2	14.7	08.5	14.6	08.7	14.6	08.8	17
18	15.9	08.5	15.9	08.5	15.7	08.7	15.6	09.0	15.4	09.3	15.4	09.3	18
19	16.8	08.9	16.8	09.0	16.6	09.2	16.5	09.5	16.3	09.8	16.3	09.8	19
20	17.7	09.4	17.6	09.4	17.5	09.7	17.3	10.0	17.2	10.3	17.1	10.3	20
21	18.5	09.9	18.5	09.9	18.4	10.2	18.2	10.5	18.0	10.8	18.0	10.8	21
22	19.4	10.3	19.4	10.4	19.2	10.7	19.1	11.0	18.9	11.3	18.9	11.3	22
23	20.3	10.8	20.3	10.8	20.1	11.1	19.9	11.5	19.7	11.8	19.7	11.8	23
24	21.2	11.3	21.2	11.3	21.0	11.6	20.8	12.0	20.6	12.3	20.6	12.3	24
25	22.1	11.7	22.0	11.8	21.9	12.1	21.6	12.5	21.4	12.9	21.4	12.9	25
26	23.0	12.2	22.9	12.3	22.7	12.6	22.5	13.0	22.3	13.4	22.3	13.4	26
27	23.8	12.7	23.8	12.7	23.6	13.1	23.4	13.5	23.2	13.9	23.1	13.9	27
28	24.7	13.1	24.7	13.2	24.5	13.6	24.2	14.0	24.0	14.4	24.0	14.4	28
29	25.6	13.6	25.6	13.7	25.4	14.1	25.1	14.5	24.9	14.9	24.9	14.9	29
30	26.5	14.1	26.3	14.1	26.2	14.5	26.0	15.0	25.7	15.4	25.7	15.4	30
31	27.4	14.6	27.3	14.6	27.1	15.0	26.8	15.5	26.6	15.9	26.6	16.0	31
32	28.3	15.0	28.2	15.1	28.0	15.5	27.7	16.0	27.4	16.4	27.4	16.5	32
33	29.1	15.5	29.1	15.6	28.9	16.0	28.6	16.5	28.3	17.0	28.3	17.0	33
34	30.0	16.0	30.0	16.0	29.7	16.5	29.4	17.0	29.2	17.5	29.1	17.5	34
35	30.9	16.4	30.9	16.5	30.6	17.0	30.3	17.5	30.0	18.0	30.0	18.0	35
36	31.8	16.9	31.7	17.0	31.5	17.5	31.2	18.0	30.9	18.5	30.9	18.5	36
37	32.7	17.4	32.6	17.4	32.4	17.9	32.0	18.5	31.7	19.0	31.7	19.1	37
38	33.5	17.8	33.5	17.9	33.2	18.4	32.9	19.0	32.6	19.5	32.6	19.6	38
39	34.4	18.3	34.4	18.4	34.1	18.9	33.8	19.5	33.4	20.0	33.4	20.1	39
40	35.3	18.8	35.3	18.9	35.0	19.4	34.6	20.0	34.3	20.6	34.3	20.6	40
41	36.2	19.2	36.2	19.3	35.9	19.9	35.5	20.5	35.2	21.1	35.1	21.1	41
42	37.1	19.7	37.0	19.8	36.7	20.4	36.4	21.0	36.0	21.6	36.0	21.6	42
43	38.0	20.2	37.9	20.3	37.6	20.8	37.2	21.5	36.9	22.1	36.9	22.1	43
44	38.8	20.7	38.8	20.7	38.5	21.3	38.1	22.0	37.7	22.6	37.7	22.7	44
45	39.7	21.1	39.7	21.2	39.4	21.8	39.0	22.5	38.6	23.1	38.6	23.2	45
46	40.6	21.6	40.6	21.7	40.2	22.3	39.8	23.0	39.5	23.6	39.4	23.7	46
47	41.5	22.1	41.4	22.2	41.1	22.8	40.7	23.5	40.3	24.2	40.3	24.2	47
48	42.4	22.5	42.3	22.6	42.0	23.3	41.6	24.0	41.2	24.7	41.1	24.7	48
49	43.3	23.0	43.2	23.1	42.9	23.8	42.4	24.5	42.0	25.2	42.0	25.2	49
50	44.1	23.5	44.1	23.6	43.7	24.2	43.3	25.0	42.9	25.7	42.9	25.7	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	62 Deg.		59 Point		61 Deg.		60 Deg.		59 Point		59 Deg.		

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Diff.	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ Point		31 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.6	26.7	44.6	26.8	52
53	46.8	24.9	46.7	25.0	46.4	25.7	45.9	26.5	43.5	27.2	45.4	27.3	53
54	47.7	25.4	47.6	25.5	47.2	26.2	46.8	27.0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.2	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26.4	49.0	27.1	48.5	28.0	48.0	28.8	48.0	28.8	56
57	50.3	26.8	50.3	26.9	49.9	27.6	49.4	28.5	48.9	29.3	48.9	29.4	57
58	51.2	27.2	51.2	27.3	50.7	28.1	50.2	29.0	49.7	29.8	49.7	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30.3	50.6	30.4	59
60	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	60
61	53.9	28.6	53.8	28.8	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.4	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.6	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	66
67	59.2	31.5	59.1	31.6	58.6	32.5	58.0	33.5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60.0	32.1	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.9	32.5	60.3	33.5	59.8	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.4	36.0	61.8	37.0	61.7	37.1	72
73	64.5	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	64.1	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64.3	38.6	64.3	38.6	75
76	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	76
77	68.0	36.2	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	79
80	70.6	37.6	70.6	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.5	41.6	69.4	41.7	81
82	72.4	38.5	72.3	38.7	71.7	39.8	71.0	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73.2	39.1	72.6	40.2	71.9	41.5	71.2	42.7	71.1	42.7	83
84	74.2	39.4	74.1	39.6	73.5	40.7	72.7	42.0	72.0	43.2	72.0	43.3	84
85	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	85
86	75.9	40.4	75.8	40.5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	42.0	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	89
90	79.5	42.3	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.3	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	92
93	82.1	43.7	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.3	84.0	46.5	83.1	48.0	82.3	49.4	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
		62 Deg.		5½ Point		61 Deg.		60 Deg.		5¾ Point		59 Deg.	

Diff.	32 Deg.		33 Deg.		3 Point		34 Deg.		35 Deg.		36 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.5	00.8	00.5	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.6	01.1	01.6	01.2	2
3	02.5	01.6	02.5	01.6	02.5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03.3	02.2	03.3	02.3	03.2	02.4	4
5	04.2	02.6	04.2	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.3	04.9	03.4	04.9	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06.8	04.2	06.7	04.4	06.6	04.4	06.6	04.5	06.6	04.6	06.5	04.7	8
9	07.6	04.8	07.5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05.4	08.3	05.6	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09.1	06.1	09.1	06.2	09.0	06.3	08.9	06.5	11
12	10.2	06.4	10.1	06.5	10.0	06.7	09.9	06.7	09.8	06.9	09.7	07.0	12
13	11.0	06.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07.6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08.3	12.4	08.3	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.8	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	14.9	10.1	14.7	10.3	14.6	10.6	18
19	16.1	10.1	15.9	10.3	15.8	10.6	15.8	10.6	15.6	10.9	15.4	11.2	19
20	17.0	10.6	16.8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.7	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.1	12.9	18.8	13.2	18.6	13.5	23
24	20.4	12.7	20.1	13.1	20.0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.8	13.9	20.7	14.0	20.5	14.3	20.2	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.6	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.7	14.8	23.5	15.2	23.3	15.6	23.2	15.7	22.9	16.1	22.7	16.5	28
29	24.6	15.4	24.3	15.8	24.1	16.1	24.0	16.2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24.3	17.6	30
31	26.3	16.4	26.0	16.9	25.8	17.2	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26.6	17.8	26.5	17.9	26.2	18.4	25.9	18.8	32
33	28.0	17.5	27.7	18.0	27.4	18.3	27.4	18.5	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29.0	19.6	28.7	20.1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20.1	30.8	20.6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21.1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22.4	31.6	22.9	39
40	33.9	21.2	33.6	21.8	33.3	22.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34.1	22.8	34.0	22.9	33.6	23.5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.8	23.9	35.6	24.0	35.2	24.7	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36.5	24.6	36.0	25.2	35.6	25.9	44
45	38.2	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.5	45
46	39.0	24.4	38.6	25.1	38.2	25.6	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38.5	27.0	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28.2	48
49	41.6	26.0	41.1	26.7	40.7	27.2	40.6	27.4	40.1	28.1	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27.8	41.4	28.0	41.0	28.7	40.4	29.4	50
Diff.	58 Deg.		57 Deg.		5 Point		56 Deg.		55 Deg.		54 Deg.		Diff.
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	

14.51
1.51

46.42

Of LATITUDE and DEPARTURE.

105

83.22

14.35

54:00

2.30

14.35

3.00

14.35

4.30

32:16

2.7

31:49

Diff.	32 Deg.		33 Deg.		3 Points		34 Deg.		35 Deg.		36 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	43.2	27.0	42.8	27.8	42.4	28.3	42.3	28.5	41.8	29.3	41.3	30.0	51
52	44.1	27.6	43.6	28.3	43.2	28.9	43.1	29.1	42.6	29.8	42.1	30.6	52
53	44.9	28.1	44.5	28.9	44.1	29.4	43.9	29.6	43.4	30.4	42.9	31.2	53
54	45.8	28.6	45.3	29.4	44.9	30.0	44.8	30.2	44.2	31.0	43.7	31.7	54
55	46.6	29.1	46.1	30.0	45.7	30.6	45.6	30.8	45.1	31.5	44.5	32.3	55
56	47.5	29.7	47.0	30.5	46.6	31.1	46.4	31.3	45.9	32.1	45.3	32.9	56
57	48.3	30.2	47.8	31.0	47.4	31.7	47.3	31.9	46.7	32.7	46.1	33.5	57
58	49.2	30.7	48.6	31.6	48.2	32.2	48.1	32.4	47.5	33.3	46.9	34.1	58
59	50.0	31.3	49.5	32.1	49.1	32.8	48.9	33.0	48.3	33.8	47.7	34.7	59
60	50.9	31.8	50.3	32.7	49.9	33.3	49.7	33.6	49.2	34.4	48.5	35.3	60
61	51.7	32.3	51.2	33.2	50.7	33.9	50.6	34.1	50.0	35.0	49.3	35.9	61
62	52.6	32.8	52.0	33.8	51.6	34.4	51.4	34.7	50.8	35.6	50.2	36.4	62
63	53.4	33.4	52.8	34.3	52.4	35.0	52.2	35.2	51.6	36.1	51.0	37.0	63
64	54.3	33.9	53.7	34.9	53.2	35.6	53.1	35.8	52.4	36.7	51.8	37.6	64
65	55.1	34.4	54.5	35.4	54.0	36.1	53.9	36.3	53.2	37.3	52.6	38.2	65
66	56.0	35.0	55.4	35.9	54.9	36.7	54.7	36.9	54.1	37.9	53.4	38.8	66
67	56.8	35.5	56.2	36.5	55.7	37.2	55.5	37.5	54.9	38.4	54.2	39.4	67
68	57.7	36.0	57.0	37.0	56.5	37.8	56.4	38.0	55.7	39.0	55.0	40.0	68
69	58.5	36.6	57.9	37.6	57.4	38.3	57.2	38.6	56.5	39.6	55.8	40.6	69
70	59.4	37.1	58.7	38.1	58.2	38.9	58.0	39.1	57.3	40.2	56.6	41.1	70
71	60.2	37.6	59.5	38.7	59.0	39.4	58.9	39.7	58.2	40.7	57.4	41.7	71
72	61.1	38.2	60.4	39.2	59.9	40.0	59.7	40.3	59.0	41.3	58.2	42.3	72
73	61.9	38.7	61.2	39.8	60.7	40.6	60.5	40.8	59.8	41.9	59.1	42.9	73
74	62.8	39.2	62.1	40.3	61.5	41.1	61.3	41.4	60.6	42.4	59.9	43.5	74
75	63.6	39.7	62.9	40.8	62.4	41.7	62.2	41.9	61.4	43.0	60.7	44.1	75
76	64.4	40.3	63.7	41.4	63.2	42.2	63.0	42.5	62.3	43.6	61.5	44.7	76
77	65.3	40.8	64.6	41.9	64.0	42.8	63.8	43.1	63.1	44.2	62.3	45.3	77
78	66.1	41.3	65.4	42.5	64.9	43.3	64.7	43.6	63.9	44.7	63.1	45.8	78
79	67.0	41.9	66.3	43.0	65.7	43.9	65.5	44.2	64.7	45.3	63.9	46.4	79
80	67.8	42.4	67.1	43.6	66.5	44.4	66.3	44.7	65.5	45.9	64.7	47.0	80
81	68.7	42.9	67.9	44.1	67.4	45.0	67.1	45.3	66.4	46.5	65.5	47.6	81
82	69.5	43.4	68.8	44.7	68.2	45.6	68.0	45.9	67.2	47.0	66.3	48.2	82
83	70.4	44.0	69.6	45.2	69.0	46.1	68.8	46.4	68.0	47.6	67.1	48.8	83
84	71.2	44.5	70.5	45.7	69.8	46.7	69.6	47.0	68.8	48.2	68.0	49.4	84
85	72.1	45.0	71.3	46.3	70.7	47.2	70.5	47.5	69.6	48.8	68.8	50.0	85
86	72.9	45.6	72.1	46.8	71.5	47.8	71.3	48.1	70.5	49.3	69.6	50.5	86
87	73.8	46.1	73.0	47.4	72.3	48.3	72.1	48.6	71.3	49.9	70.4	51.1	87
88	74.6	46.6	73.8	47.9	73.2	48.9	73.0	49.2	72.1	50.5	71.2	51.7	88
89	75.5	47.2	74.6	48.5	74.0	49.4	73.8	49.8	72.9	51.0	72.0	52.3	89
90	76.3	47.7	75.5	49.0	74.8	50.0	74.6	50.3	73.7	51.6	72.8	52.9	90
91	77.2	48.2	76.3	49.6	75.7	50.6	75.4	50.9	74.5	52.2	73.6	53.5	91
92	78.0	48.7	77.2	50.1	76.5	51.1	76.3	51.4	75.4	52.8	74.4	54.1	92
93	78.9	49.3	78.0	50.6	77.3	51.7	77.1	52.0	76.2	53.3	75.2	54.7	93
94	79.7	49.8	78.8	51.2	78.2	52.2	77.9	52.6	77.0	53.9	76.0	55.3	94
95	80.6	50.3	79.7	51.7	79.0	52.8	78.8	53.1	77.8	54.5	76.9	55.8	95
96	81.4	50.9	80.5	52.3	79.8	53.3	79.6	53.7	78.6	55.1	77.7	56.4	96
97	82.3	51.4	81.4	52.8	80.7	53.9	80.4	54.2	79.5	55.6	78.5	57.0	97
98	83.1	51.9	82.2	53.4	81.5	54.4	81.2	54.8	80.3	56.2	79.3	57.6	98
99	84.0	52.5	83.0	53.9	82.3	55.0	82.1	55.4	81.1	56.8	80.1	58.2	99
100	84.8	53.0	83.9	54.5	83.1	55.6	82.9	55.9	81.9	57.4	80.9	58.8	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
58 Deg.			57 Deg.		5 Points		56 Deg.		55 Deg.		54 Deg.		

Diff.	3½ Point.		37 Deg.		38 Deg.		39 Deg.		3½ Point		40 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.6	01.2	01.6	01.2	01.6	01.2	01.6	01.3	01.5	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.2	02.5	03.1	02.5	03.1	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	03.9	03.1	03.9	03.1	03.9	03.2	03.8	03.2	5
6	04.8	03.6	04.8	03.6	04.7	03.7	04.7	03.8	04.6	03.8	04.6	03.9	6
7	05.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	06.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	06.6	08.8	06.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.5	07.4	09.3	07.6	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.0	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.6	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.2	11.7	09.4	11.6	09.5	11.5	09.6	15
16	12.9	09.5	12.8	09.6	12.6	09.9	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.7	10.1	13.6	10.2	13.4	10.5	13.2	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	14.0	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.1	14.6	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.3	15.5	12.5	15.5	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12.6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.9	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.6	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.6	15.2	18.4	15.4	24
25	20.1	14.9	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.6	21.6	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.5	22.9	17.9	22.5	18.2	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.1	23.6	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.7	24.4	19.1	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.1	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.6	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.3	27.2	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	28.0	21.1	27.6	21.5	27.2	22.0	27.1	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.2	28.0	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.6	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.3	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	27.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	28.9	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	36.3	29.8	36.0	30.2	47
48	38.6	28.6	38.3	28.9	37.8	29.6	37.3	30.2	37.1	30.5	36.8	30.9	48
49	39.4	29.2	39.1	29.5	38.6	30.2	38.1	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	39.9	30.1	39.4	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	4½ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

Diff.	3 $\frac{1}{4}$ Point		37 Deg.		38 Deg.		39 Deg.		3 $\frac{1}{2}$ Point		40 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	41.0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39.4	32.4	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41.0	32.0	40.4	32.7	40.2	33.0	39.8	33.4	52
53	42.6	31.6	42.3	31.9	41.8	32.6	41.2	33.4	41.0	33.6	40.6	34.1	53
54	43.4	32.2	43.1	32.5	42.6	33.2	42.0	34.0	41.7	34.3	41.4	34.7	54
55	44.2	32.8	43.9	33.1	43.3	33.9	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45.0	33.4	44.7	33.7	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	34.0	45.5	34.3	44.9	35.1	44.3	35.9	44.1	36.2	43.7	36.6	57
58	46.6	34.5	46.3	34.9	45.7	35.7	45.1	36.5	44.8	36.8	44.4	37.3	58
59	47.4	35.1	47.1	35.5	46.5	36.3	45.8	37.1	45.6	37.4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36.7	48.1	37.6	47.4	38.4	47.2	38.7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.5	39.9	62
63	50.6	37.5	50.3	37.9	49.6	38.8	49.0	39.6	48.7	40.0	48.3	40.5	63
64	51.4	38.1	51.1	38.5	50.4	39.4	49.7	40.3	49.5	40.6	49.0	41.1	64
65	52.2	38.7	51.9	39.1	51.2	40.0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.6	42.4	66
67	53.8	39.9	53.5	40.3	52.8	41.3	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52.8	42.8	52.6	43.1	52.1	43.7	68
69	55.4	41.1	55.1	41.5	54.4	42.5	53.6	43.4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.1	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	43.7	55.2	44.7	54.9	45.0	54.4	45.6	71
72	57.8	42.9	57.5	43.3	56.7	44.3	56.0	45.3	55.7	45.7	55.2	46.3	72
73	58.6	43.5	58.3	43.9	57.5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44.5	58.3	45.6	57.5	46.6	57.2	46.9	56.7	47.6	74
75	60.2	44.7	59.9	45.1	59.1	46.2	58.3	47.2	58.0	47.6	57.5	48.2	75
76	61.0	45.3	60.7	45.7	59.9	46.8	59.1	47.8	58.7	48.2	58.2	48.8	76
77	61.8	45.9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	62.6	46.5	62.3	46.9	61.5	48.0	60.6	49.1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	62.3	48.6	61.4	49.7	61.1	50.1	60.5	50.8	79
80	64.3	47.7	63.9	48.1	63.0	49.3	62.2	50.3	61.8	50.8	61.3	51.4	80
81	65.1	48.3	64.7	48.7	63.8	49.9	62.9	51.0	62.6	51.4	62.0	52.1	81
82	65.9	48.8	65.5	49.3	64.6	50.5	63.7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49.4	66.3	49.9	65.4	51.1	64.5	52.2	64.2	52.7	63.6	53.4	83
84	67.5	50.0	67.1	50.6	66.2	51.7	65.3	52.9	64.9	53.3	64.3	54.0	84
85	68.3	50.6	67.9	51.2	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
86	69.1	51.2	68.7	51.8	67.8	52.9	66.8	54.1	66.5	54.6	65.9	55.3	86
87	69.9	51.8	69.5	52.4	68.6	53.6	67.6	54.7	67.3	55.2	66.6	55.9	87
88	70.7	52.4	70.3	53.0	69.3	54.2	68.4	55.4	68.0	55.8	67.4	56.6	88
89	71.5	53.0	71.1	53.6	70.1	54.8	69.2	56.0	68.8	56.5	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.9	56.6	69.6	57.1	68.9	57.9	90
91	73.1	54.2	72.7	54.8	71.7	56.0	70.7	57.3	70.3	57.7	69.7	58.5	91
92	73.9	54.8	73.5	55.4	72.5	56.6	71.5	57.9	71.1	58.4	70.5	59.1	92
93	74.7	55.4	74.3	56.0	73.3	57.3	72.3	58.5	71.9	59.0	71.2	59.8	93
94	75.5	56.0	75.1	56.6	74.1	57.9	73.0	59.2	72.7	59.6	72.0	60.4	94
95	76.3	56.6	75.9	57.2	74.9	58.5	73.8	59.8	73.4	60.3	72.8	61.7	95
96	77.1	57.2	76.7	57.8	75.6	59.1	74.6	60.4	74.2	60.9	73.5	61.7	96
97	77.9	58.8	77.5	58.4	76.4	59.7	75.4	61.0	75.0	61.5	74.3	62.4	97
98	78.7	58.4	78.3	59.0	77.2	60.3	76.2	61.7	75.8	62.2	75.1	63.0	98
99	79.5	59.0	79.1	59.6	78.0	61.0	76.9	62.3	76.5	62.8	75.8	63.6	99
100	80.3	59.6	79.9	60.2	78.8	61.6	77.7	62.9	77.3	63.4	76.6	64.3	100
Diff.	4 $\frac{3}{4}$ Point		53 Deg.		52 Deg.		51 Deg.		4 $\frac{1}{2}$ Point		50 Deg.		Diff.
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	

A Table of DIFFERENCE

Diff.	41 Deg.		42 Deg.		3½ Point		43 Deg.		44 Deg.		4 Points		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01.3	01.5	01.4	01.4	01.4	01.4	01.4	2
3	02.3	02.0	02.2	02.0	02.2	02.0	02.2	02.0	02.2	02.1	02.1	02.1	3
4	03.0	02.6	03.0	02.7	03.0	02.7	03.0	02.7	02.9	02.8	02.8	02.8	4
5	03.8	03.3	03.7	03.3	03.7	03.4	03.7	03.4	03.6	03.5	03.5	03.5	5
6	04.5	03.9	04.5	04.0	04.4	04.0	04.4	04.1	04.3	04.2	04.2	04.2	6
7	05.3	04.6	05.2	04.7	05.2	04.7	05.1	04.8	05.0	04.9	04.9	04.9	7
8	06.0	05.2	05.9	05.4	05.9	05.4	05.9	05.5	05.8	05.6	05.7	05.7	8
9	06.8	05.9	06.7	06.0	06.7	06.0	06.6	06.1	06.5	06.3	06.4	06.4	9
10	07.5	06.6	07.4	06.7	07.4	06.7	07.3	06.8	07.2	06.9	07.1	07.1	10
11	08.3	07.2	08.2	07.4	08.2	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07.9	08.9	08.0	08.9	08.1	08.8	08.2	08.6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	08.7	09.6	08.7	09.5	08.9	09.3	09.0	09.2	09.2	13
14	10.6	09.2	10.4	09.4	10.4	09.4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12.1	10.5	11.9	10.7	11.9	10.7	11.7	10.9	11.5	11.1	11.3	11.3	16
17	12.8	11.2	12.6	11.4	12.6	11.4	12.4	11.6	12.2	11.8	12.0	12.0	17
18	13.6	11.8	13.4	12.0	13.3	12.1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13.9	13.0	13.7	13.2	13.4	13.4	19
20	15.1	13.1	14.9	13.4	14.8	13.4	14.6	13.6	14.4	13.9	14.1	14.1	20
21	15.8	13.8	15.6	14.0	15.6	14.1	15.4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14.4	16.3	14.7	16.3	14.8	16.1	15.0	15.8	15.3	15.6	15.6	22
23	17.4	15.1	17.1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15.7	17.8	16.1	17.8	16.1	17.6	16.4	17.3	16.7	17.0	17.0	24
25	18.9	16.4	18.6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17.1	19.3	17.4	19.3	17.5	19.0	17.7	18.7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20.0	18.1	19.7	18.4	19.4	18.8	19.1	19.1	27
28	21.1	18.4	20.8	18.7	20.7	18.8	20.5	19.1	20.1	19.5	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.8	20.9	20.1	20.5	20.5	29
30	22.6	19.7	22.3	20.1	22.2	20.1	21.9	20.5	21.6	20.8	21.2	21.2	30
31	23.4	20.3	23.0	20.7	23.0	20.8	22.7	21.1	22.3	21.5	21.9	21.9	31
32	24.1	21.0	23.8	21.4	23.7	21.5	23.4	21.8	23.0	22.2	22.6	22.6	32
33	24.9	21.7	24.5	22.1	24.5	22.2	24.1	22.5	23.7	22.9	23.3	23.3	33
34	25.7	22.3	25.3	22.7	25.2	22.8	24.9	23.2	24.5	23.6	24.0	24.0	34
35	26.4	23.0	26.0	23.4	25.9	23.5	25.6	23.9	25.2	24.3	24.7	24.7	35
36	27.2	23.6	26.8	24.1	26.7	24.2	26.3	24.6	25.9	25.0	25.5	25.5	36
37	27.9	24.3	27.5	24.8	27.4	24.8	27.0	25.2	26.6	25.7	26.2	26.2	37
38	28.7	24.9	28.2	25.4	28.2	25.5	27.8	25.9	27.3	26.4	26.9	26.9	38
39	29.4	25.6	29.0	26.1	28.9	26.2	28.5	26.6	28.1	27.1	27.6	27.6	39
40	30.2	26.2	29.7	26.8	29.6	26.9	29.3	27.3	28.8	27.8	28.3	28.3	40
41	30.9	26.9	30.5	27.4	30.4	27.5	30.0	28.0	29.5	28.5	29.0	29.0	41
42	31.7	27.6	31.2	28.1	31.1	28.2	30.7	28.6	30.2	29.2	29.7	29.7	42
43	32.5	28.2	32.0	28.8	31.8	28.9	31.4	29.3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29.4	32.6	29.5	32.2	30.0	31.6	30.6	31.1	31.1	44
45	34.0	29.5	33.4	30.1	33.3	30.2	32.9	30.7	32.4	31.3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33.6	31.4	33.1	32.0	32.5	32.5	46
47	35.5	30.8	34.9	31.4	34.8	31.6	34.4	32.1	33.8	32.6	33.2	33.2	47
48	36.2	31.5	35.7	32.1	35.6	32.2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32.9	35.8	33.4	35.2	34.0	34.6	34.6	49
50	37.7	32.8	37.2	33.5	37.0	33.6	36.6	34.1	36.0	34.7	35.4	35.4	50
Diff.	Dep	Lat	De	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
49 Deg.	48 Deg.	4½ Point	47 Deg.	46 Deg.	4 Points								

109

33.55
14.18

Dist.	41 Deg.		42 Deg.		3 $\frac{1}{2}$ Point		43 Deg.		44 Deg.		4 Points		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	38.5	33.5	37.9	34.1	37.8	34.3	37.3	34.8	36.7	35.4	36.1	36.1	51
52	39.2	34.1	38.6	34.8	38.5	34.9	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38.1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	36.8	38.8	37.5	38.2	38.2	54
55	41.5	36.1	40.9	36.8	40.8	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42.3	36.7	41.6	37.5	41.5	37.6	41.0	38.2	40.3	38.9	39.6	39.6	56
57	43.0	37.4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	40.3	57
58	43.8	38.1	43.1	38.8	43.0	39.0	42.4	39.6	41.7	40.3	41.0	41.0	58
59	44.5	38.7	43.8	39.5	43.7	39.6	43.2	40.2	42.4	41.0	41.7	41.7	59
60	45.3	39.4	44.6	40.1	44.5	40.3	43.9	40.9	43.2	41.7	42.4	42.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.6	43.9	42.4	43.1	43.1	61
62	46.8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.6	43.1	43.8	43.8	62
63	47.5	41.3	46.8	42.2	46.7	42.3	46.1	43.0	45.3	43.8	44.5	44.5	63
64	48.3	42.0	47.6	42.8	47.4	43.0	46.8	43.6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.7	47.5	44.3	46.8	45.2	46.0	46.0	65
66	49.8	43.3	49.0	44.2	48.9	44.3	48.3	45.0	47.5	45.8	46.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44.6	50.5	45.5	50.4	45.7	49.7	46.4	48.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.3	50.5	47.1	49.5	47.9	48.8	48.8	69
70	52.8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50.4	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.6	47.7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.4	48.4	52.7	49.1	51.8	50.0	50.9	50.9	72
73	55.1	47.9	54.2	48.8	54.1	49.0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.8	48.6	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51.4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.9	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51.0	55.6	51.8	54.7	52.8	53.7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52.5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52.2	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.9	58.5	53.1	57.8	53.9	56.8	54.9	55.9	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58.5	54.6	57.5	55.6	56.6	56.6	80
81	61.1	53.1	60.2	54.2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	60.9	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60.7	56.6	59.7	57.7	58.7	58.7	83
84	63.4	55.1	62.4	56.2	62.2	56.4	61.4	57.3	60.4	58.4	59.4	59.4	84
85	64.1	55.8	63.2	56.9	63.0	57.1	62.2	58.0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57.8	62.9	58.7	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.6	58.2	64.5	58.4	63.6	59.3	62.6	60.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65.2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67.2	58.4	66.1	59.6	65.9	59.8	65.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66.9	60.2	66.7	60.4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.5	66.6	62.1	65.5	63.2	64.3	64.3	91
92	69.4	60.4	68.4	61.6	68.2	61.8	67.3	62.7	66.2	63.9	65.1	65.1	92
93	70.2	61.0	69.1	62.2	68.9	62.5	68.0	63.4	66.9	64.6	65.8	65.8	93
94	70.9	62.7	69.9	62.9	69.7	63.1	68.8	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62.3	70.6	63.6	70.4	63.8	69.5	64.8	68.3	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.2	69.8	67.4	68.6	68.6	97
98	74.0	64.3	72.8	65.6	72.6	65.8	71.7	66.8	70.5	68.1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.0	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
101 Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	101 Dist.
	49 Deg.		48 Deg.		4 $\frac{1}{2}$ Point.		47 Deg.		46 Deg.		4 Points		

The Use and Explanation of the Table of Difference of Latitude and Departure.

THIS is a Table larger and better contriv'd than any of this Nature yet extant, giving the Difference of Latitude and Departure in Minutes and Tenths, and to any Distance not exceeding 100 Miles to every Degree and Quarter-point of the Compass; and may be used to a greater Distance, being taken out at twice or thrice, according to the Quantity of the Distance, as shall be shewn in the Use.

The Course stands at the Head and Foot of the Table, to every Deg. and Quarter-point of the Compass; at the Head it begins at 1 deg. so 2 deg. $\frac{1}{4}$ point, &c. encreasing to 45 deg. or 4 Points. At the Foot it begins at 45 deg. or 4 Points, so 46 deg. 47 deg. $4\frac{1}{4}$ Point, &c. encreasing backwards to 90 deg. or 8 Points. The Distance stands in the two outmost Columns under the Title *Dist.* which on the Left-hand Page begins at 1 and runs to 50; on the Right-hand Page it begins at 51, and runs to 100, the Difference of Latitude and Departure stands under the Course at the Head, and over it at the Foot of the Table.

The USE of the Table.

This Table is very useful in Navigation, especially in working a *Traverse*.

Example 1. The Course and Distance given, to find the Difference of Latitude and Departure by the Table.

Suppose a Ship sails N. N. E. $\frac{3}{4}$ E. 95 Miles, and the Difference of Latitude and Departure required.

On the Right-hand Page (because the Distance is above 50) and at the top (because it is less than 4 Points) look for $2\frac{3}{4}$ Points, which is the Course; under which, and against 95 the Distance, and under the Title *Lat.* stands 81.5, which is 81 min. $\frac{5}{8}$ the Difference of Latitude, and under the Title *Dep.* stands 48.8, which is 48 min. $\frac{8}{10}$ which is the Departure required.

Example 2. Suppose a Ship sails South 56 deg. Westerly 48 Miles, the Difference of Latitude and Departure required.

On the Left-hand Page (because the Distance is less than 50) and at the bottom because it is more than 45d.) look for 56d. the Course; over which, and against 48 the Distance, over the Title *Lat.* stands 26.8 that is 26 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* stands 39.8, that is 39 min. $\frac{8}{10}$ the Departure required.

Example 3. Suppose a Ship sails North West by North 160 Miles, and the Difference of Latitude and Departure required by the Table.

On the Right-hand Page at the top, look for 3 Points, the Course. Now because the Table goes but to 100, take for 100 first; therefore under 3 Points, and against 100, under the Title *Lat.* stands 83.1 that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* stand 55.6, that

that is 55 min. $\frac{1}{8}$ the Departure, then for 60 under 3 Points, and against 60, under the Title *Lat.* stands 49.9, that is 49 min. $\frac{1}{8}$ the Difference of Latitude, and under the Title *Dep.* stands 33.3, that is 33 min. $\frac{1}{8}$ the Departure, then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, the Sum is 133 min. the Difference of Latitude, and 88 $\frac{1}{8}$ the Departure required.

This Table is also useful in the Resolution of the rest of the Problems of *Plain Sailing*, which for Brevity sake are omitted here, being taught at large, in the last Edition of *Practical Navigation*; but the general Use of it is in the exact Working of a Traverse.

Example 1. Suppose a Ship bound to a certain Port, sails S. E. by S. 49 min. then E S E. $\frac{1}{2}$ E. 52 min. then E. by N. $\frac{1}{2}$ E. 62 min. then SSW. $\frac{1}{2}$ W. 57 min. then S. $\frac{1}{2}$ E. 39 min. to find the Difference of Latitude and Departure the Ship hath made.

Set down the several Courses and Distances; first allowing for Leeway, if any; then proceed to look out the Difference of Latitude and Departure for each Course and Distance (by the Directions before given) in the Table, placing them in their proper Columns, (*viz.*) If the Course be Northerly, the Difference of Latitude must be put in the North Column; if Southerly, in the South Column; If the Departure be Easterly it must be put in the East Column; if Westerly in the West Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and subtract the lesser Difference of Latitude and Departure from the greater, and the Remainder is the Difference of Latitude and Departure.

The TABLE.

Courses	Distances	Diff. of Latitude		Departure	
		North	South	East	West
SE by S.	49		40.7	27.2	
ESE $\frac{1}{2}$ E.	52		15.1	49.7	
E by N $\frac{1}{2}$ E.	62	06.1		61.7	
SSW $\frac{1}{2}$ W.	57		50.3		26.9
S $\frac{1}{2}$ E.	39		38.8	03.8	
		06.1	144.9	142.4	26.9
			06.1	26.9	
			138.8	115.5	

The whole Diff. of Lat. is 138 $\frac{8}{10}$ S. the Dep. 115 $\frac{5}{10}$ E. then to find the Course and Distance, find the Lat. and Dep. in their proper Columns, but the Tables not extending so far, I take half of each, *viz.* half the Diff. of Lat. 69.4, and half the Dep. 57.7 the nearest to which, in the Columns of Lat. and Dep. in the Traverse Table is 69.6 and 57.1, over which at the Top I find 3 $\frac{1}{2}$ Point for the Course

South Easterly, or SE $\frac{1}{2}$ S. and in the Column of Dist. 90, which doubled (because I took half the two Numbers) is 180 the Distance required.

Example

The Use of the Table.

Example 2. The Courses being given in Degrees, which often happens, by reason of Allowance for the *Variation of the Compass*, and in the like Cases.

Suppose a Ship bound to a certain Port, sails 65 Miles North, 34 deg. Westerly. Then 56 Miles North, 67 deg. Westerly. Then 48 Miles South, 78 degrees Westerly. Then 54 Miles North, 23 deg. Easterly. Then 36 Miles North, 6 deg. Easterly, and the Difference of Latitude and Departure required.

The Table.

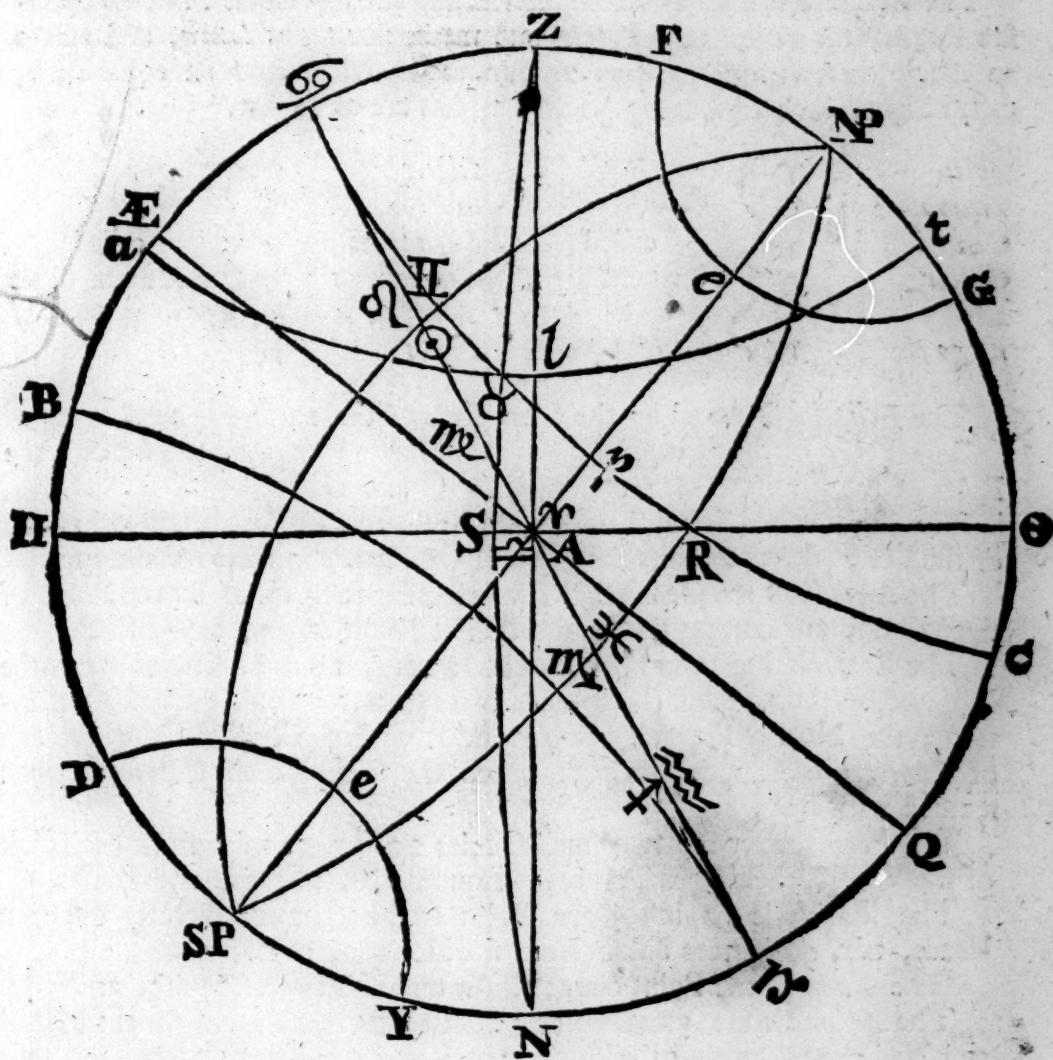
Courses		Distances	Diff. of Latitude.		Departure.	
			North	South	East	West
NW	34°	65	53.9			36.3
NW	67°	56	21.9			51.5
SW	78°	48		10.0		47.0
NE	23°	54	49.7		21.1	
NE	6°	36	35.8		03.8	
			161.3	10.0	24.9	134.8
			10.0			24.9
			151.3			109.9

The whole Difference of Latitude is $151\frac{3}{10}$ North, the Departure $109\frac{9}{10}$ West. The Course and Distance is found as in the last Example.

But if you would keep a Reckoning both in Latitude and Longitude, you may also find the Difference of Longitude by the *Traverse Table*, (according to *Middle Latitude Sailing*) thus : Find the Complement of Middle Latitude in the Degrees, at the Top or Bottom of the Table, and under or above that in the Column of Departure, find your Departure, and right against that, in the Column of Distance, you have the Difference of Longitude.

Example. Suppose in the last Instance of a *Traverse*, the Ship hath sailed from Latitude 50 deg. 00 min. North, then because the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is, 52 deg. 31 min. and consequently the Middle Latitude is 51 deg. 16 min. its Complement 38 deg. 44 min. which being nearest 39 deg. I look for 39 at the Head of the Table, and under it in the Column of Dep. I look for the Departure 110, but the Table not proceeding so far, I take its half, viz. 55, the nearest to which in the Table, is 54.7 (being less) against which, in the Column of Distance is 87, which doubled (because I took half the Departure) the Sum 174 min. or 2° 54' is the Difference of

Longitude required, which is sufficiently exact for common Practice: only I would advise all Persons for avoiding as much as possible any Error, that every Time the Reckoning is corrected by an Observation, the Longitude be also corrected according to *Mercator's Sailing*, as you are taught in the last Edition of *Practical Navigation*.



Some necessary Astronomical Definitions.

THE Poles of the Equinoctial (commonly called the Poles of the World) are two fixed Points in the Heavens, opposite one to another; the one visible to us, called the North Pole, marked with the Letters N. P; the other not visible to us, called the South Pole, marked with S. P.

P

The

The *Axis* of the World is a Line imagined to pass from Pole to Pole, about which is performed the diurnal Revolution, as the Line NPASP.

The *Equinoctial* is a great Circle 90 deg. distant from the Poles of the World, and divides the Globe into the North and South Hemispheres; it is noted by the Letters $\mathcal{E}AQ$.

The *Ecliptick* is a great Circle intersecting the Equinoctial in two opposite Points, the beginning of *Aries* and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 29 min. It is divided into 12 equal Parts, called Signs, each containing 30 deg. which are as follow.

<i>Aries</i>	γ	} called Northern Signs	<i>Libra</i>	$\approx$	} called Southern Signs
<i>Taurus</i>	δ		<i>Scorpio</i>	m	
<i>Gemini</i>	Π		<i>Sagittarius</i>	z	
<i>Cancer</i>	$\mathfrak{C}$		<i>Capricornus</i>	v	
<i>Leo</i>	Ω		<i>Aquarius</i>	$\approx$	
<i>Virgo</i>	M		<i>Pisces</i>	$\times$	

The *Ecliptick* is noted by the Characters of the 12 Signs, as above.

The Poles of the *Ecliptick* are two Points 23 deg. 29 min. from the Poles of the Equinoctial, represented by G and D.

The *Zodiack* is a Zone, having about 8 degrees of Breadth on either side of the Ecliptick, and limits the Latit. of the Planets in their Revolutions.

The *Meridians* are great Circles intersecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles, as NPRSP.

The *Tropicks* are two small Circles 23 deg. 29 min. distant from the Equinoctial, being parallel thereto, and limits the Sun's greatest Declination; the North Tropick being mark'd with $\mathfrak{C}$ C, called the Tropick of *Cancer*; the South Tropick called the Tropick of *Capricorn*, and marked with B v .

The *Polar Circles* are two small Circles 23 deg. 29 min. from each Pole of the World, being parallel to the Equinoctial, as FeG and DeY.

The *Zenith* is an imaginary Point in the Heavens directly over our Heads, viz. 90 degrees distant from the Horizon, as Z.

The *Nadir* is the Point diametrically opposite to the Zenith, as N.

The *Azimuths* are great Circles intersecting each other in the Zenith and Nadir, and cutting the Horizon at Right Angles, as ZSN.

The *Horizon* is a great Circle 90 deg. distant from the Zenith and Nadir, and divides the World into the visible and invisible Hemispheres, as HAO.

The *Meridian* of a Place, is that Meridian that passeth by the Zenith and the Nadir of the said Place, and is represented by the Circle ZNPOQNSPHÆZ.

Parallels of Altitude or *Almicanters*, are small Circles parallel to the Horizon; imagined to pass through any Degree of Altitude between the Horizon, and the Zenith, as alt.

Parallels,

Parallels of Declination or *Latitude*, are small Circles parallel to the Equinoctial, and are called *Parallels of Declination*, with respect to the Heavens, and *parallels of Latitude* respecting the Earth, as $\odot$ PRC.

The *Latitude* of a Star, is an Arch of a Circle of Longitude, contained between the Center of the Star and the Ecliptick, and is accounted either Northerly or Southerly.

The *Longitude* of a Star, is an Arch of the Ecliptick, contained between the Circle of Longitude passing by the Star, and the beginning of *Aries*, and is accounted according to the Order of the Signs.

The *Declination* of the Sun or Star, is an Arch of the Meridian, contained between the Center of the Sun or Star, and the Equinoctial, and is accounted either Northerly or Southerly.

The *Right Ascension* is that Degree and Minute of the Equinoctial, that comes to the Meridian with the Center of the Sun or Star.

Oblique Ascension is the Degree and Minute of the Equinoctial, that riseth with the Center of the Sun or Star.

Oblique Descension is the Degree and Minute of the Equinoctial, that sets with the Center of the Sun or Star.

Ascensional Difference is an Arch of the Equinoctial, contained between the Right and Oblique Descension or Ascension, or it is the Difference of Time between the Sun-rising or Setting, and Six a Clock.

The *Amplitude*, is an Arch of the Horizon, being the Distance of the Rising or Setting of the Sun or Star from the East or West, and is accounted either Northerly or Southerly.

The *Latitude* of a Place, is the height of the Pole above the Horizon, or the distance between the Zenith and the Equinoctial.

Longitude on the Earth, is an Arch of the Equinoctial, contained between the Meridian of the Place where the Longitude is assigned to begin, and the Meridian of any other Place, and is accounted Easterly and Westerly.

Astronomical Problems useful in Navigation.

P R O B L E M I.

THE Sun's Place and greatest Declination given, to find it's present Declination.

Example.

Suppose the Sun's Place to be 20d. 30m. of *Gemini*, the greatest Declination is 23d. 29m. it is required to find the present Declination.

The Operation by the Logarithms.

As Radius	_____	_____	_____	_____	10.000000
Is to S. Sun's greatest Declination 23d. 29m.	_____	_____	_____	_____	9.600409
So is S. Sun's Longitude 80d. 30m from <i>Aries</i>	_____	_____	_____	_____	9.994003
To S. Sun's present Declination 23d. 08m. North	_____	_____	_____	_____	19.594412
					By

By the Gunter.

The Extent from Radius S. 90° , to S. $23^{\circ} 29'$, shall reach from S. $80^{\circ} 30'$ to the S. $23^{\circ} 8'$ the Sun's Declination North because in a Northern Sign.

Note, The Sun's Longitude is reckoned from the next Equinoctial Point, Therefore if the Sun be in *Aries*, *Taurus*, *Gemini*, *Capricornus*, *Aquaries*, or *Pisces*, the Longitude is accounted from *Aries*: but if in *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, it is accounted from *Libra*.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, are called Northern Signs; *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius*, and *Pisces*, are called Southern Signs. Consequently, if the Sun's Place be in any of the first six Signs, the Declination is North; but if any of the latter six, the Declination is South.

P R O B. II.

The Sun's greatest Declination and present Declination given, to find his Place.

The Sun's greatest Declination is 23d. 29m. and present Declination is 18d. 30m. North increasing, the Sun's Place required.

By the Logarithms.

As the S. of the Sun's greatest Declination 23d. 29m.	—	9.600409
To Radius	—	10.000000
So is the Sine of the present Declination 18d. 30m. North	—	9.501476
To the Sine of the Sun's Longitude 52d. 46m.	—	9.901067

That is one Sign (30d. making a Sign) and 22d. 46m. from *Aries*, because the Declination is North and increasing, that is 22d. 46m. of *Taurus*; but if the Declination had been North decreasing, it must have been accounted from *Libra*, and then it would have been 7d. 14m. in *Leo*.

By the Gunter.

The Extent of the Compasses from the Sine 23d. 29m. the greatest Declination, to Radius S. 90° shall reach from S. 18d. 30m. the Sun's present Declination, to S. 52d. 46m. the Sun's Longitude as above.

P R O B. III.

The Sun's Place and greatest Declination given, to find the Right Ascension.

Example.

The Sun's Place $10^{\circ} 30'$ in *Aquarius*, and the Right Ascension required.

The Operation by the Logarithms.

As Radius	—	10.000000
To the Tangent of the Sun's Longitude from <i>Aries</i> 49d. 30m.	—	10.068501
So is the Sc. of the greatest Declination 23d. 29m.	—	9.962453
To the Tangent of the Sun's Right Ascension 47d. 2m.	—	10.030954

By

By the Gunter.

The Extent from Radius S. 90d. to Sc. of the greatest Declination 66d. 31m. shall reach from Tangent Sun's Longitude from *Aries*, 49d. 30m. to Tangent Right Ascension 47d. 2m. required.

Note, This Proportion gives the Sun's Right Ascension from the next Equinoctial Point; but it ought to be accounted from *Aries*, according to the Order and Succession of the Sign, and therefore in this Case 47d. 02m. subtracted from 360d. gives 312d. 58m. the Right Ascension from *Aries*.

P R O B. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude?

Example.

The Latitude 51d. 32m. North, and the Sun's Declination 15d. 20m. North, what is the Amplitude?

The Operation by the Logarithms.

As Sc. of the Latitude 51d. 32m.	_____	_____	9.793832
To Radius	_____	_____	10.000000
So is the S. of the Declination 15d. 20m. North	_____	_____	9.422318
To the S. of the Sun's Amplitude 25d. 9m.	_____	_____	9.628486

By the Gunter.

The Extent from the Sc. of the Latitude 38d. 28m. to the Sine of the Declination 15d. 20m. North, shall reach from Radius S. 90d. to S. 25d. 9m. the Sun's Amplitude North, as above.

Note, If the Declination be North, the Amplitude is North, and if the Declination be South, the Amplitude is also South.

P R O B. V.

The Latitude of a Place, and the Sun's Declination given, to find the Ascensional Difference.

Example.

Suppose in the Latitude 51 deg. 32 min. North, the Sun's Declination is 10 deg. 45 min. North, and the Ascensional Difference required.

The Operation by the Logarithms.

As Tangent Complement Latitude 51 deg. 32 min.	_____	_____	9.900085
To Radius	_____	_____	10.000000
So is the Tangent of the Sun's Declination 10d. 45 m.	_____	_____	9.278424
To S. of the Ascensional Difference 13 deg. 49 min.	_____	_____	9.378339

By

By the Gunter.

The Extent from Tangent $38^{\circ} 28'$ (the Comp. of Latitude) to Tang. $10^{\text{deg.}} 45 \text{ min.}$ the Sun's Declination; shall reach from Radius S. $90^{\text{d.}}$ to S. $13^{\text{deg.}} 49 \text{ min.}$ the Sun's Ascensional Difference, as above.

P R O B. VI.

To find the Oblique Ascension and Descension.

First, Find the Ascensional Difference by the fifth Problem.

Secondly, the Right Ascension by the third Problem.

Then if the Sun's Declination be North, the Ascensional Difference subtracted from the Right Ascension, gives the Oblique Ascension, and added thereto, gives the Oblique Descension. But if the Sun's Declination be South, the Ascensional Difference added to the Right Ascension, gives the Oblique Ascension, and subtracted gives the Oblique Descension.

Note, That if the Ascensional Difference exceed the Right Ascension, add to the Right Ascension 360^{Degrees} , then subtract the Ascensional Difference therefrom.

Or, if both being added together exceed $360^{\text{d.}}$ the Excess is the Oblique Ascension or Descension.

P R O B. VII.

To find the Time of the Sun's rising and setting, and length of the Day or Night.

Find the Ascensional Difference by the fifth Problem, which convert into Hours and Minutes of Time, accounting for $15^{\text{deg.}}$ of the Equinoctial one Hour, and for every degree 4 Minutes of Time, and for every 15 Minutes of the Equinoctial 1 Minute of Time.

If the Sun's Declination be Northerly, the Ascensional Difference added to six Hours, gives the Time of Sun-setting; and subtracted is the Time of Sun-rising.

If the Declination be Southerly, contrarily the Ascensional Difference added, gives the Time of Sun-rising; subtracted is the Time of setting.

The Time of Sun-setting doubled, gives the Length of the Day; the Time of Sun-rising doubled, is the Length of the Night.

Example.

In Latitude $51^{\text{d.}} 32^{\text{m.}}$ North, suppose the Sun's Declination $21^{\text{d.}} 57^{\text{m.}}$ North, the Ascensional Difference is $30^{\text{d.}} 29^{\text{m.}}$ which reduc'd into Time is

	H.	M.		H.	M.
	2	02			
	6	00			
Sun setteth	8	02	} doubled is {	16	04 length of the Day.
Sun riseth	3	58		7	56 length of the Night.

P R O B.

P R O B. VIII.

The Latitude of a Place, the Sun's Altitude and Declination given, to find the Azimuth required.

The Rule.

Take the Complement of the Altitude, the Comp. of the Latitude, and the Comp. of the Declination to 90 deg. add them together, and take the half Sum; subtract the Compl. of the Declination from the half Sum, and take the Remainder; then set down the Compl. Arithmetical of the Sines of the Compl. Altitude, and Compl. Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of these four Logarithms is the Sc. of half the Azimuth required.

Note, If the Declination be South in North Latitude, or North in South Latitude, instead of taking the Complement of the Declination to 90 deg. there must be 90 deg. added thereto, and then proceed as before.

The Operation by the Logarithms.

d.	m.		
42	: 30	Compl. Altitude	_____ S. Co. Ar. 0.170317
38	: 28	Compl. Latitude	_____ S. Co. Ar. 0.206168
69	: 30	Compl. Declination	

150 : 28 Sum

75	: 14	Half Sum	S. _____ 9.985414
5	: 44	Excess of the half Sum above c. Decl.	S. _____ 8.999560

Sum 19.361459

6rd. 21m. _____ Sc. _____ half Sum 9.680729

6rd. 21m.

doubled 122d. 42m. the Sun's Azimuth from the North required.

The Operation by Gunter's-Scale.

The Extent of the Compasses from Radius S. 90 deg. to S. 42 deg. 30 min. the Complement of the Altitude, shall reach from S. 38d. 28m. the Complement of the Latitude, to S. 24 deg. 40 min. then the Extent from Sine 24 deg. 40 min. to Sine 75 deg. 14 min. the half Sum shall reach from Sine 5 deg. 44 min. the Excess of the half Sum, above the Complement Declination to 122 deg. 42 min. (upon the Line of Verfed Sines) which is the Azimuth required.

Example

Exemp. 2. In the Latitude of 51 deg. 32 min. North, the Sun's Declination is 18 deg. 15 min. South, his Altitude 17 deg. 45 min. and the Azimuth from the North required.

The Operation by the Logarithms.

d.	m.			
72	: 15	Comp. Altitude	_____	S. Co. Ar. 0.021182
38	: 28	Comp. Latitude	_____	S. Co. Ar. 0.206168
108	: 15	Declination 90 deg. being added, because South.		
218	: 58	Sum		
109	: 29	Half-sum Comp. to 180° is 70° 31' S.	_____	9.974391
1	: 14	Remainder	_____	S. _____ 8.332924
		d. m.		Sum 18.534665
		79 : 20	_____ Sc. _____	half-sum 9.267332
		79 : 20		

which doubled is _____ 158 : 40 the Azimuth from the North required.

By the Gunter.

The Extent from Radius S. 90d. to the S. 72d. 15m. the Compl. Altitude, shall reach from the Sine 38d. 28m. the Complement Latitude, to the S. 36d. 20m. then the Extent from the S. 36d. 20m. to S. 70d. 31m. the Complement of 109d. 29m. (the half-sum) to 180d. shall reach from the Remainder S. 1d. 14m. to 158d. 40m. (upon the Line of Versed Sines) the Sun's Azimuth as above.

In South Latitude, the Operation is the same with the two preceding Examples, only the Azimuth is found from the South.

After the same manner you may find the Azimuth of any Star.

P R O B. IX.

The Latitude of the Place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example. In the Latitude 51 deg. 32 min. North, suppose the Sun's Declination 23 deg. 29 min North, the Altitude 36 deg. 30 min. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude to 90°, add them together, and take the half-sum, subtract the Complement of the Altitude from the half-sum, and take the Remainder, then set down the Complement

ment Arithmetical of the Sine Complement of the Declination, and Complement Latitude, and thereto add the Sines of the half Sum and Remainder : half the Sum of these four Logarithms, is the S. c. of the half Time required in Degrees and Minutes of the Equinoctial.

The Operation by the Logarithms.

d.	m.			
66	31	Compl. Declination	—————	S. Co. Ar. 0.037547
38	28	Compl. Latitude	—————	S. Co. Ar. 0.206168
53	30	Compl. Altitude		
158	29	Sum		
79	14	Half Sum	—————	Sine — 9.992287
25	44	Remainder	—————	Sine — 9.637673
	d.	m.		Sum 19.873675
	30	09	Sc. —————	Half Sum 9.936837
	30	09		

which doubled is 60 18. and reduced into Time, makes 4 hours 1 min. $\frac{1}{5}$, the Hour of the Day in the Afternoon.

But if it had been in the Forenoon, 4 hours 1 min. $\frac{1}{5}$ subtracted from 12 hours, leaves 7 hours 58 min. $\frac{4}{5}$ for the Time in the Morning.

If the Declination had been Southerly, then instead of taking the Complement of the Declination to 90 deg. there must be 90 deg. added thereto, as in the second Example of the Eighth Problem; do the same when the Declination is North in South Latitude.

By the Gunter.

The Extent of the Compasses from Radius S. 90d. to S. 66m. 31m. the Complement of the Declination, shall reach from S. 38d. 28m. the Complement Latitude, to S. 34d. 40m. then the Extent from S. 34d. 40m. to the S. of 79d. 14m. the half sum shall reach from S. 25d. 44m. the Remainder, to 60d. 18m. (upon the Line of Verfed Sines) the Hour of the Day as above.

P R O B L E M X.

Having the Latitude of the Place, the Sun's Right Ascension, with the Right Ascension, Declination, and Altitude of a Star given, to find the Hour of the Night.

Q

Example

Example.

In the Latitude of 51 deg. 32 min. North, on the 7th of *January* 1745, the Sun's Right Ascension was 20 hours 1 min. the Right Ascension of the *Lion's Tail* was 11 hours 31 min. the Declination 19 deg. 10 min. North, the Altitude 30 deg. 30 min. to the Eastward of the Meridian, the Hour of the Night required.

The RULE.

To the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Sun's Altitude; add them together, and take the half Sum, subtract the Complement of the Altitude from the half Sum, and reserve the Remainder; then set down the Complement Arithmetical of the Sines of the Complement of the Star's Declination and of the Latitude of the Place, and thereto add the Sines of half the Sum and Remainder: Half the Sum of these four Logarithms, is the Sc. of half the Distance from the Meridian.

The Operation by the Logarithms.

d. m.

73 : 50 Compl. Star's Declination ——— S. Co. Ar. 0.017523
 38 : 28 Compl. Latitude ——— S. Co. Ar. 0.206168
 59 : 30 Compl. Star's Altitude

171 : 48 Sum

85 : 54 Half Sum ——— Sine ——— 9.998887
 26 : 24 Remainder ——— Sine ——— 9.648004

Sum 19.870291

30d. 31m. ——— Sc. ——— Half Sum 9.935291
 30d. 31m.

which doubled is 61d. 02m. and reduced into Time, gives four Hours, four Minutes eight Seconds, or $\frac{1}{5}$ of a Minute.

By the Directions given in the Use of the Table of the Sun's Right Ascension, and of the Right Ascension and Declination of the fixed Stars, find the Time of the Star's coming upon the Meridian, if the Star be to the Eastward of the Meridian subtract the Star's Distance from the Meridian in Time, from the Time of the Star's coming upon the Meridian; but

but if the Star be to the westward of the Meridian, add the Star's Distance from the Meridian, to the Time of the Star's coming to the Meridian; the Sum or Difference is the hour of the Night. In this Example, The Sun's Right Ascension 20 Hours 01 Minute subtracted from the Sun's Right Ascension (with 24 Hours added thereto) 35 Hours 31 Minutes, leaves 15 Hours 30 Minutes, the Time of the Star's coming on the Meridian; from which subtracting 4 Hours 4 Minutes leaves 11 Hours 26 Minutes; the Hour of the Night.

Note farther, If the Sun's Declination be South in North Latitude, or North in South Latitude, instead of taking the Complement Declination, to 90 deg. there must be 90 deg. added thereto, as has been shewn in the Eighth preceding Problem.

The Operation by Gunter's-Scale.

The Extent of the Compasses from Radius S. 90d. to the S. of 37 Degrees 50 Minutes the Complement of of the Star's Declination, shall reach from S. 38 Degrees 28 Minutes the Complement of the Latitude, to the S. 36 Degrees 40 Minutes; then the Extent from the S. 36 Degrees 40 Minutes, to S. 85 Degrees 54 Minutes the half Sum, shall reach from S. 26 Degrees 24 Minutes the Remainder, to 61 Degrees 02 Minutes (upon the Line of Verfed Sines required.) With which proceed as has been directed to find the Hour of the Night.

Courses and Distances between some of the most eminent Places on the Coast of England, &c. As also the thwart Courses between the East Coast of England and Holland, the South Coast of England and France, and the West Coast of England and Ireland.

	Leag.
FROM <i>Whitby</i> to <i>Tinmouth</i> , NW. by N. ————	14
From <i>Bockness</i> to <i>Catness</i> , North West ————	27
From the <i>North Foreland</i> to <i>Flushing</i> , East ————	24½
From the <i>North Foreland</i> to the <i>Texel</i> , North East ————	52
From the <i>Spurn</i> to the <i>Texel</i> , East by South ————	56
From <i>Tinmouth</i> to the <i>Naze</i> of <i>Norway</i> , NE. by E. ————	120
From <i>Tinmouth</i> to <i>Holy Land</i> , East by South ————	116
From <i>Tinmouth</i> to the <i>Scaw</i> , E.N.E. ————	110
From <i>Yarmouth</i> to the <i>Texel</i> , East by North ————	34
Q 2	From

From Newcastle to Maes Deep, E N E.	83
From Aberdeen to Maes Deep, South East	113
From the North Foreland to the Maes, E N E	30
From Newcastle to the Fly, E S E.	90
From Scarborough to Holy Land, East Northerly	97
From the Start to the Eddystone, West half South	6
From the Land's End to Silly, W. S. W. three quarters W.	9
From the Caskets to Blackness, East North East	55
From Beachy to Blackness, East a quarter North	15
From Dover to Diep, South half West	25
From the Lizard to Guernsey, East by South	35
From the Start to Seven Isles, South half East	25
From Silly to Ushant, South East by South	35
From the Lizard to Ushant, South	27
From Hartland Point to the Island of Londey, North	3
From Londey to the Holms, East by North	18
From Black Rock to Tuscar, East North East	3
From Cape Clear to Old Head, East by North	13
From Gresholm to Waterford, West by North	21
From the Land's-end of England to Tuscar, North by West	40
From the Land's-end of England to Waterford, NNW.	40
From Holy Head in the Island Anglesey, to the Bar of Dublin, W. by N.	18 $\frac{1}{2}$
From Rochel to Black Rock, South by East	80
From the Land's-end of England to Cape Clear, NW by W.	55
From the Land's-end of England to Old Head, North West	45

A Table of the Soundings coming into the Channel, respecting the Bearing and Distances of Silly, Ushant, the Lizard, &c. with the Depth in Fathoms and the various sorts of Ground.

Bearings.	Dit.	Lat.		Dep.	The various sorts of Ground.	
		D.	M.			
Silly.	South	05	50	20	50	Branny sand, like Ground Wheat
	S S E	05	50	12	45	White sand mixed with shells
	S S E	06			50	Coarse Owse
	E S E	06			53	Coarse sand and fine red shells
	E by S	08	50	12	78	Owse sand, with Queen shells amongst it
	E by N	07	49	15	72	Owse like Mustard seed, with broken shells
	E by N	15	48	50	72	Pepper sand, black and yellow
					E. by N.	

	Bearings.	Dit.	Lat.		Dep.	<i>The various sorts of Ground.</i>
			D	M.		
<i>Silly.</i>	E by N	24	49	50	72	Black, white, and red Stones with Owse
	ENE	07	49	15	60	Some black Sand
	ENE	20	49	15	80	Rocky Ground
	ENE	55			103	Fine white Sand
	NE by E	22	49	10	85	Sand and Owse together
	NE by E	10	49	20	55	White and red sand mix'd with shells
	NE by E	50	49	50	100	White sand with Owse and Nits
	NE by E	25	49	50	64	Branny sand with white and red shells
	NE by E	06	49	10	48	Black sand
	NE by E	13	49	43	65	Branny sand with some pieces of shells
	North East	10	49	40	65	Branny sand, small stones, Herring Bones
	NE by N	10	49	20	57	Small red Sand
	NNE	10	49	47	100	White sand then entring on the Bank
	N by E	18			68	Red sand with black & white scollop shell.
	North	12	49	15	65	Broken shells with white and red sand
	North	10	49	47	65	White sand on the E. part of the Bank
	NNW	33	48	52	77	Red sand and shells amongst it
	NW by N	07	49	40	54	More shells, the <i>Lizard</i> NE. dist. 18 leag.
	North West	04	50	10	50	Branny sand with black and broken shells
	North West	07	49	47	60	Stony Ground
	NW by N	04	50	25	61	Red and black sand, with glistering shells
	NW by W	2½			44	Shells and sand like the points of Needles
	W by N	13	50	25	63	Fine white sand with little Owse
	West	21	50	08	66	Red and black sand with glistering shells
	West by S	32	49	50	75	Fine white sand and glistering shells
	West by S	3½			40	Like broken Wheat or Coarse Bran
<i>Upant.</i>	North	06	48	36	63	Full of small Mace sand
	N by E	18	48	15	80	Round stones mixed with scollop shells
	NE by N	11			60	Small beaten shells and Hakes Teeth
	North East	29	48	50	85	Great and small pieces of Cockle shells
	North East	25	48	10	55	Gray and brown Sand with white shells
	NE by N	07	48	30	68	White and gray Mace sand
	ENE	14	48	36	68	Small shells and Herring Bones
	E by N	25	48	30	85	White and gray sand with small red stones
	East	18	49	00	70	Branny sand, with some shells
	East	06	49	00	65	Red sand, shells things like needles points
	East	15	49	15	70	Fine white sand
	East	33	49	15	87	Dazling sand like Barley-straw
	East	04	49	10	60	Full of Mace sand and broken she'lls
						E by S.

Soundings coming into the Channel.

	Bearings	Dift.	Lat.		Dep.	The various sorts of Ground.
			D.	M.		
Urbant.	E by S	14	49	56	63	Shells like Perriwinkles
	E S E	15	48	15	70	Shells gray and red pieces of Cockle shells
	E S E	12	49	20	68	Gross white sand with shells
	E S E	08	49	05	64	White shells and fine small stones
	E S E	06			60	Hakes Teeth & Shells like Oatmeal Husks
	S E by E	20	49	15	72	Great stones like Pease and Beans
	S E by E	09	49	15	65	Sand and some shells
	S E by E	37	48	30	65	James's shells
	S E by E	15	49	25	60	Small Scollop shells with some stones

	Bearings	Dift.	Dep.	The various sorts of Ground.
Lizard.	North East	6½	43	Marshy shells and some Scollop shells
	N E by N	10	52	Marshy shells and Hakes Teeth
	N N E	09	50	Marshy shells like Oatmeal Husks
	N by E	15	58	Marshy shells and Hakes Teeth
	North	01	39	Stones as big as Beans four Leagues off
	North West	05	45	Gray sand like Oatmeal Flower
	North West	03	46	Marshy shells and small stones
	W N W	3½	47	Small shingly stones, and marshy shells
	W by N	04	40	Fine marshy shells and white stones
	W by S	03	41	Black gravelly Ground with small stones
	N E by E	12	57	Scollop shells
	N E by E	04	44	Great stones and rough Ground
	North East	6½	50	Like Husks of Oatmeal and small stones

Eddy Stone.	N half a Mile	35	Dirty brown sand and Hakes Teeth
	W. 2 Mile	34	Dirty brown sand
	S. 1 Mile	26	Fine sand, and within this 28 and 30 Fath.

Start.	N E. by E. Nly	8½	40	{ Like the Dust of a Grindstone with Hakes Teeth and shells
	N. W. by W.	4½	43	
	N. W. by N.	03	38	{ Gravelly sand, small stones and shells Reddish shells mashed as if beat in a mortar, white sand and scollop shells
	N. by W. W. ly	12	38	
	NW by W.	14	43	

Foreland

Soundings coming into the Channel.

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		Bearings		Dit.	Dep.	The various sorts of Ground.
Foreland.	{	NE by E	08	35		Small shingly stones as big as Pease
		North	08	40		Streamy Ground with small stones
		N by E	5½	33		The same with some black sands
		NE by N	11	41		Fine sand and scollop shells
		NNE.	08	40		Fine sand, scollop shells and small stones
		NE by E	2½	27		Shingly Ground
		WNW	2½	20		Small stones
Needles.	{	NE by E	02	17		Great shingly Ground
		NE half E	2½	15		Small shingly Ground
		North East	02	13		Rocky Ground
I. Wight.	{	N by W	3½	20		All the Ground from Albions to the E. end of the
		E by N	04	21		Wight is chalky and brown sand
		N by E	03	18		
Dunrope.	{	W by S.	04	16		Rough Ground with some big stones
		West	04	21		A kind of sandy fishy Ground
		WNW	08	33		Fishing Ground somewhat red, with stones a
		N by W	06	26		big as Pease, and small Beans

Directions to sail into some of the Principal Harbours on the Coast of England.

Directions to sail into Silly.

SILLY is divided into divers Islands; along the West-side lieth a great many Rocks. There are several Channels through which to go in, but the Southermost called St. Mary's Sound is the best, being a fair opening of the Channel, but near the midst lie two sunken Rocks, which in foul Weather the Sea may be seen to break over: It is best to leave them on the Larboard-side going in, and on the Starboard-side coming out: Go so near the Starboard-shore, as that a Stone might almost be thrown on shore. And when you are within the Point, luff up round, and come to an Anchor in the sight of the Houses; or when the Town is brought open to the Valley, leave two thirds of the Harbour on the Larboard-side.

To sail into some of the Principal Harbours

Directions for Sailing into Mount's-Bay.

To anchor in Guavers Lake.

There is certainly two funken Rocks, which lie right in the way of going into the Lake, about a Mile without your Anchoring Place; these Rocks lie N N W. and S S E. about half a Mile in length, to shun which observe as follows.

If the Wind is in the Eastern Hank give the Eastern Shore about a League Birth, and keep *St. Paul's Church* wholly in sight above the Hill, till you bring a Church on the Eastern Shore a Sail's Breadth to the Northward of *St. Michael's Mount*, then bear away for the Lake Hill, keeping your Mark till you run *St. Paul's Church* down under the Hill, then let go your N.E. Anchor, and carry the other to the S. W. and you will be well moor'd, and in good fine Ground all Sand.

You may come in, keeping one half of the Church above the Hill, you'll clear them to the Eastward, and when it shuts down you are to the westward of them, and when upon them the Top of the Tower and a long Hedge is in one, about 6 or 7 foot at low Water.

If the Wind is in the southern or western Hank keep the Land on board, which is bold; you may go within a quarter of a Mile of the Point; run till you shut *Moufehole Island* in, and *St. Paul's Church* down under the Land well, to come too with your SW. Anchor, then carry the other to the NE. you will be well moor'd in fine Ground as before mentioned: Be sure to have the Church on the Eastern shore a Sail's Breadth to the Northward of the Mount.

If your Ground Tackling is good your Anchors will never start, the Wind at S. S. E. or S. E. heaves in a great Sea, and raises a great Ground Sea when blowing hard; the harder it blows you have a stronger Out-set in your Favour; there is no Tide, you always ride Head to Wind, your Anchors will sooner start with the Wind to the N. or NW. because the Ground goes out with a little Descent.

To sail into Foy.

Foy may be very easily known, lying in between two high Lands; on the West-side the going in, is an old Church and Castle, and on the East-side the Ruins of an old Church, as you may see by the making of it in *Capt. Collin's Draught of Foy*. The going in is a Cable's Length over from side to side and no Danger; when you are in you may Anchor before the Town, or run up above the Town. In the time of the *Dutch War*, in the Year 1666, there was above sixty Sail of *Virginia Ships* put into this Harbour. This Place lieth N E. and S W. in and out, which makes it a better Out-let to the westward than *Plymouth* or *Falmouth*. And whereas
at

it hath been reported to be a Bar-Harbour, and that you cannot enter till half Tide. I do assure you that there is no less than 3 Fathom at low Water at a Spring Tide: Here you may lie ashore to wash, tallow, and stop Leaks; the Spring Tides rise and fall 16 and 17 Foot, and it is high Water here at Full and Change half an Hour past 5. There is good anchoring in the Road without the Harbour, from 5 to 10 Fathom Water, but without that Depth foul Ground.

To sail into Falmouth.

Upon the West Point of the Haven of *Falmouth*, standeth a Castle on the high Land called *Pendennis* Castle. In the Entry nearest the said West side lieth a Rock above Water, you may sail in at either side of it, at the inner side of the East Point lie also some Rocks off the Shore; on the East-side is deepest Water, and most Room, therefore in going in, give the East Point a large Birth; there will be 7 or 8 Fathom. Keep the said Shore till you come within *St. Maud's* Castle; which when it bears East there will be 16 or 17 Fathom, but half the Harbour over towards the *Smithick* is but 4 or 5 Fathom; observe in going in to keep the *Manacles* open and shut on the Point of *Falmouth* Castle, and so it must be kept till you shut the Church over *Penny Comquick*, into the N. E. end of the *Smithick*, and so bear over to *St. Maud's*, and ride with the Castle East, laying one Anchor in 18 Fathom, and the Westernmost Anchor in four Fathom, as shall seem most convenient.

To sail into Plymouth.

At the Eastermost Point of *Plymouth Sound* lieth a high round Rock called *Mewstone*; between it and the *Ramhead* lieth the said *Sound*, North North East, being round and deep.

A little to the Northward of *Ramhead*, is a fair sandy Bay, where is good Anchoring close under the Land, in 9 or 10 Fathom: South a little Easterly from *Ramhead*, lies a Rock above Water called the *Eddystone*, the Point of *Plymouth* lies from it N. by E. distant about 4 Leagues.

In the *Sound*, by the Land of *Plymouth*, lieth an Island called *St. Nicholas*, or *Drake Island*, which is joined to the West-side, with a Range of Rocks under Water, so that you may sail along to the Eastward of it.

To sail into Catwater.

To sail into *Catwater*, run in between the Island and the Point on the East-side with the Land of *Plymouth*, till *Catwater* open on the Starboard side, then go in to the Eastward between the Point of *Plymouth*, and the

Point on the Starboard-side, leaving most part of the Channel on the Starboard-side, until you come within the Point, and anchor there right against the high steep Northern Land; there is at low Water, with extraordinary high Tides 4 and 5 Fathom.

In sailing into *Catwater*, be sure to give a good Birth to the Southern Point of the Entry, for there lies off the said Point a Ledge of Rocks under Water, about 2 Cable's Length off from the Land. Upon the Point of the Ledge lies a Buoy, where is about 12 foot Water at half Flood, which Buoy must be left on the Starboard-side going in, and when *Catwater* is altogether open you may run in to the Eastward, leaving in the Entry of the Harbour two thirds of the Channel on the Starboard-side, as aforesaid, because the South Shore is somewhat flat off, there lying a sandy Bank, which reacheth to the second Point of the South Shore of *Catwater*.

A little to the Eastward of *Drake Island* lies a Rock under Water, upon which at low Water it is deeper than two Fathom. To sail within the Land you may go to the Eastward or Westward of the Rock, as Occasion serves.

To sail into Dartmouth.

Dartmouth hath a narrow Entry lying in between two high Lands: On each side of the Haven standeth a little Castle; on the West-side is a Church on the high Land, called *St. Patrick's Church*. To sail in coming from the Westward, run in along by the West Land, so far to the Eastward until the Key of the Village (on the East-side of the Haven) be brought in the midst of the Entry of the Haven between the two Lands; it is convenient to have a Boat ready (if any Gust of Wind should come from the high Land) to row in. Being come in, edge over to the West-side before the Brewhouse, and anchor there in 10 or 11 Fath. or before the Village to the East-side at Pleasure. At the East-side lieth a sunken Rock, to avoid which steer in with *St. Patrick's Church*, and do not bring the Village, which standeth on the West-side of the Harbour, without the said Church, but keep the outer House of the said Village in the East-side of the Chappel always in sight, without the Bulwarks on the North-side by *St. Patrick's Church*, then there is no Danger of the Rock, in the Range by the North Point. Between *Dartmouth* and the *Start*, nearest to *Dartmouth* standeth a white square Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To sail into Torbay.

Bring the West Point of the *Berry S.* by E. or S.S.E. from you; and anchor there in 7 or 8 Fathom, where you shall be Landlock'd for a S. and S. W.

SW. Wind. At the North East end of the Bay is also a Tide Haven called the *Tormain*; before it is very good Anchor Ground in 4 or 5 Fath. according as you desire to be nearer or farther from the Shore.

Directions for sailing in at the East-end of the Isle of Wight to Portsmouth Harbour, and also to Hampton.

If you come from the Eastward with a Northerly Wind, bound into the *Isle of Wight* or *Portsmouth*; after you come to the Westward of the Shoal called the *Owers*, hale in North West with *St. Hellen's Point*; but do not hale too much to the Northwards, for there lies a Bank off of *Longstone Haven*, to the Eastward of the *Horse*, that hath not above 13 Foot on it at low Water; but keeping in 7 or 8 fath. carrieth you clear without it, and will bring you to the S. E. end of the Sand called the *Horse*. *St. Hellen Church* being S. W. by W. from you, you may run in 5 Fath. and when you have brought the Westermost great white Patch, or Chalk upon *Parch Down* (which is the high Land to the Northwards of *Portsmouth*) a Ships Length to the Westward of *South-Sea Castle* that stands upon the Beach, then you may luff up without Fear: Being then to the Westward of the *Horse*, and steering with that Mark, it will lead you in along the *Horse* unto the Beach, and so into the Harbour of *Portsmouth*, keeping along close by the Shore, until you come to the Town-wall's-end, and there you must bear off a little for a Flat, that lieth off from the Shore; this is for an Easterly Wind. But if you intend for *Stoaks-Bay*, when you have brought the Fire Beacon on *Brown Down*, which is to the W. N. W. of *Hastlewood Point* within a Ship's Length without the said Point, then you may bear to the Westwards along the out-side of the *Spithead*, which is the Shoal on the West-side of the Entrance of *Portsmouth Haven*.

If the Wind be Westerly or Southerly, and you are coming from the Westward, and design for *St. Hellen's Road* or *Stoaks bay*; from *Dunnose* to *St. Hellen's Point*, the Course is N. E. by N. and N. N. E. but borrow no nearer to *St. Hellen's* than 6 or 7 Fathom, for the *Spit* lies off a great way; but if it be clear Weather, that you may keep *Sand Down Castle* open of the *Culver Cliff*, that Mark will lead you without the *Spit* of the Point; steer along in this Mark, until you open *St. Hellen's Church* about two Ships Length open of the *Red Cliff* within *St. Hellen's Point* or *Port-Sea Castle* to the Eastwards of *South Sea Castle*, then are you clear of the Point, and may steer to *St. Hellen's Road* N. W. and having brought the Point S. by W. or between that and the S. by E. you may anchor in 7 or 8 Fathom Water on very good Ground.

Note, That you have no good clear Ground all along the Island until you have opened St. *Hellen's* Church, as aforesaid, and have brought the Point to bear from you S S W.

From St. *Hellen's* Point, to go between *No Man's Land* and the *Horse*, the direct Course in, is N W. by N. and NW. but you have no shoaling upon the SW. side of *No Man's Land*, for you have 16 Fathom, and the next Cast but 3; but at the *Horse* you may stand into 10, 9, or 8 Fathom: If the strong Tide be spent, and smooth Water, you shall have a great washing of them by the Overfall of the Water; but especially on *No Man's Land*, if it be clear Weather, there are very good Marks to lead you in, which are as follows; keep the two Windmills on the *Downs* on the *Isle of Wight*, that they may be seen clear all over the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and so up all along the Island without some middle Ground that lieth WSW. off the Point of *No Man's Land*.

Also from St. *Hellen's-point* (if it be clear Weather that you can see it) there is a direct Mark, viz. a part of an old Castle formerly called *Hastewood* Castle, standing on *Gilkeker* Point (which is kept white,) keep *Gosport* Church and that Castle in one, or this Castle in the middle of the Wood about the Church, which sheweth with a Valley like a Saddle, and so you may run directly in without Fear. Or if the Wind be so that you are forc'd to turn in, then you may run the said Mark within two Sail's Breadth of each End of the Wood. In the middle of the Channel is 11 fathom Water; and if you bring the said Mark right under the North End of the Wood you shall run in a middle Ground near the *Horse* that hath not above 10 Foot on it at low Water, and hard Sand.

To sail within the Wight in thick Weather.

To sail between the *Main* and the *Wight* in thick Weather borrow in 6 fathom off St. *Hellen's* and steer NW. by N. and NNW. from St. *Hellen's* Point, till you have 12 Fathom, and then steer more Westerly, as you find the Depth; come no nearer *No Man's Land* than 9 or 10 fathom; in that Depth you may keep along the *Wight* Side, if the Wind be southerly; but if it be large, keep in 14 or 15 Fathom, which is a good Birth from both sides, and so steer W by S. and WSW. as you find the Depth until you come to *Cows*. *Note*, That being about *Stoak's-bay*, there will be less Water, if you go nearer to *Cows*, there you may anchor in 12 or 14 Fathom, in the midst of the Channel, where is good owsey Ground.

Directions for Dover Road.

The best Ground in *Dover Road* is with the *Whiteway*, to the NW. of *Dover Castle*, or between that Hill that comes from St. *James's* Church, which

which is a flat Steeple at the North-end of *Dover Town*, for a thwart Mark, and so in what Depth you please, from 12 to 14 fathom. Thwart of *Foulstone* in 12 or 14 Fathom is very good Ground.

Directions to sail into the North-Foreland through the Gulls in the Night.

If your ground Tackle should fail in the Night riding at the *North-Foreland*, as very often hath happened, and you cannot weather the *Foreland*, weather the *Northsand-head*; if you can but see the *North Foreland Light*, when that Light-house bears NW. or NW. by N. then bear over into 8 or 9 Fathom, and being in that Depth (steering S.S.W.) you may be sure it will carry you directly through with the *Brake*, but keeping your Lead carefully, borrowing no nearer the *Brake* than five Fathom, nor going without nine Fathom, or nine and an half, as you have the Tide under you; this Course will lead you through without Danger.

Directions for the North end of the Goodwin, for such as sail from the North-Foreland to the Southward in the Night.

If you be at the *North-Foreland*, bound for the *Downs*, and that the Tides do fall out too early or too late; to turn into the *Downs* with the Wind at SW. or SSW. take the following Directions.

If it be in the Morning before Day, then be sure to weigh Anchor in convenient Time, to be at the *Northsand-head* at the turning of the Tide, to the Southward. From the *Foreland* you may steer out with a Flood Tide, S. E. by E. and S.E. or keep the Light of the *North-Foreland* NW. by N. this Course will lead you out. But for the more Certainty, be sure keep the Lead well, and then you may borrow off and on with the foresaid Winds, in 7 or 8 Fathom, and steering out with the foresaid Course, you shall find the Depth suddenly change to 15 or 20 Fathom; then you may hale up close to the Southward, along the back of the *Goodwin*, the Eastermost side of which lies S.S.W. and N.N.E. 12 or 14 Fathom, and is not above a Saker-shot from the Sand. But if it be in the Day Time, and the Wind blows so hard that you cannot well tack to run through the *Gulls*, then the Marks to carry you out at the *Northsand-head*, is the flat Church upon the *Foreland* called *St. Peter's*, a Ship's Length to the Northwards of *Broad-stairs* Pier-head; or borrow upon the Sand by the Lead as aforesaid, and so taking the first of the Tide without the Sand, you may stand to the South Eastwards, till the *South-Foreland* bears W. by S. then cast about, and you shall weather the *Southsand-head*, and be in the *Downs-Road* as soon as any other Ship that parted with you at the *Foreland*.

Directions for sailing over the Spits, the Wallet, and by the Naze into Harwich.

Sailing down the *Swin* or *King's Channel*, and that you would fail into *Harwich* over the Buoy of the *Spits* into the *Wallet*, you must observe your Tides, for at the *Spits* the Buoy lieth in 5, 6, or 7 Foot Water at low Water, and the Passage often alters, sometimes more Water, sometimes less. The Buoy lieth on the West-end of the *Gunfleet* Sand, and the East-end of the *Buxey*, being from a flat Steeple, called *Great Holland Church*, South and by East. Being over the *Spits*, you come into the *Wallet*, where is very good Anchoring in 5, 6, 7 or 8 Fathom Water; the Sands lying without, makes it a most excellent Road. There is a good and deep Channel to sail in at the *Wallet*, between the *Gunfleet* and the *West Rock*, but 'tis seldom used. Being over the *Spits*, in the *Wallet*, steer away for the *Naze*, which may be known by the Trees, and a House that standeth on it, keep about half a Mile, or a Mile off from the *Naze*, to avoid the Stone Bank which hath but 5 Foot Water on it at low Water; and lieth from the *Naze* Trees E. by N. About a Mile and an half from the *Naze* Point, there is about 8 or 9 Foot Water between it and the *Naze* at low Water: Keep *Payn's* Trees that lie a little to the Southward of *Harwich*, open and shut with *Harwich Cliff*, and this Mark will carry you on the Stone Banks, and the Trees on the *Corkland*, just open of the *Nazeland*, will carry you on the Bank also. There is a good leading Mark to carry you between the *Naze* and the Stone Bank, which is *Harwich* Steeple, on *Harwich* Beacon Cliff; and will also carry you between the *Pyesand*, and the Ridge and the *Rowling Ground*, where Ships anchor in 3 and 4 Fathom at low Water. The Mark to anchor in the best of the *Rowling-ground*, is to bring *Harwich* Windmill two Sails breadth open to *Harwich-Cliff*: And to sail from the *Rowling-ground* to the *Naze* keep *Payn's* Trees open of *Harwich-Cliff*, till you bring the *Naze* to bear S. W. then keep *Harwich* Steeple, on the Beacon Cliff, to run within the Stone Bank. There is a Channel to sail from the *Naze* between the Cork Sand and the Ridge, keeping the *Naze* Trees S. W. sailing down N. E. between the Cork and the Ridge, in 5, 6, and 7 Fath. Water. And when you have brought *Harwich* Steeple with the Brew-house that lieth to the Northward of *Languard-Fort*, then are you clear of the Cork Ledge; this Channel is much used by the Light Colliers going to the Northwards.

Being in the *Rowling-grounds*, and that you would fail into *Harwich* Harbour, keep close by the *Andrews*, which is a Sand that lieth off from *Languard-Fort*, and is steep too on the West-side; The Tide of Ebb runneth strong over the *Andrews* the first half Ebb, of which you must have

have a Care. This Sand is dry at low Water; keep close by the Beach of *Languard Fort*, to avoid the *Altar*, which is a small stony Shelf that lieth right West from *Languard Fort*, about a Cable and an half's Length from the Beach at the Fort, on which is but 5 and 6 Foot at low Water. You may sail to the Westward of it, between it and *Harwich Cliff*, according as the Tide is up, and what Draught of Water your Ship draweth: but if you should want to go into *Harwich* at low Water, and a Ship draw above 15 Foot, you must stay for the Flood to have Water over the *Glutton*, which is a narrow Ridge that stretcheth off from the Beach thwart the Channel, a little within the Brewhouse, that is to the Northward of *Languard Fort*: Being past the *Glutton*, you must keep close to the Beach, to avoid the Gristle, that lieth in the middle between *Harwich* and the Beach of *Languard Fort*, on which is but three Foot at low Water, there is a small Channel between the Gristle and the Guard, of 9 Foot at low Water, but when you have opened *Dover Court Church* of *Harwich Town*, then are you clear of the Gristle and the Guard, and may anchor before the Town of *Harwich*, in 5 fathom Water, to run into *Ipswich Water*, and anchor; this is a very safe Harbour, and if a Ship should chance to blow a-shore she cannot take harm, the Shores being soft owse. The Spring-Tides rise 15 and 16 Foot, and the Neep-Tides 10 and 11 Foot.

Directions to sail into Harwich through the Sled-way.

Being at the Buoy of the *Spits*, and that you will not fail over the *Spits*, then keep down by the *Gunfleet Sand*, in 7 or 8 fath. Water, till you come within two Miles of the Buoy of the *Gunfleet*, and then come no nearer than 9 fathom Water, for there lieth off a *Spit*, E.S.E. from the Sand about a Cable's Length; to the Eastward of this *Spit* is a small Swatch through the Sand, into which, and *Goldmore's Gat*, the Tide of Flood setteth strong into the *Wallet*; of which you must have a Care when you come near it, especially in little Winds or Calms, you may be haled on the *Gunfleet-sand*; this Sand lieth N. E. and S. W. and drieth in several Places: The Buoy of the *Gunfleet* beareth from the Naze S. E. by E. Easterly: you may stand into 7 or 8 Fathom along the side of the W. Rock into the *Sledway*, keeping *Balfey Church* N. by W. and N. N. W. till you bring *Harwich Steeple* on the Brewhouse (that lieth to the Northward of *Languard Fort*) which will carry you clear of the Cork Ledge, on which is two Fathom and an half at low Water, and then stand to the Westward, and keep *Orford Church* and Castle open of *Balfey Church* a Sail's Breadth, till you have the Lights together, keeping them so till you are past the *Andrews*, and then follow the former Directions for sailing into *Harwich*: you must stand in upon

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upon the *Platters* into 5 Fathom, on which Sand is but 2 or 3 Foot at low Water; the Ridge hath 7 Foot at low Water; a great part of the Cork Sand drieth at low Water; and lieth in length N.E. and S.W. about two Miles and an half long, and a Mile broad; West Rocks lie in length N.E. and S.W. about 3 Miles, and 2 Miles broad, and drieth at several Places, full of Banks and Swatches, the Ground rocky and stony in many Places; there is a small narrow Channel between the West Rocks and the Cork.

For the more particular Directions for Sailing into these and other Harbours in *England, Scotland, Holland, Normandy, Bretagne, &c.* see the last Edition of the *Coasting Pilot*, newly Corrected and Reprinted for Messieurs *Mount and Page* on *Tower-Hill, London*, with many Additions.



F I N I S.

As the *Diff. Lat.* ^S ---
 is to *Radius* ---
 So is the *Diff. Long.* ---
 To the *Tang. of the Course*

As *Radius* ^S
 is to *True Diff. Lat.*
 So is the *Secant of Course*
 To the *Dist.*

